THE MODEL ENGINEER

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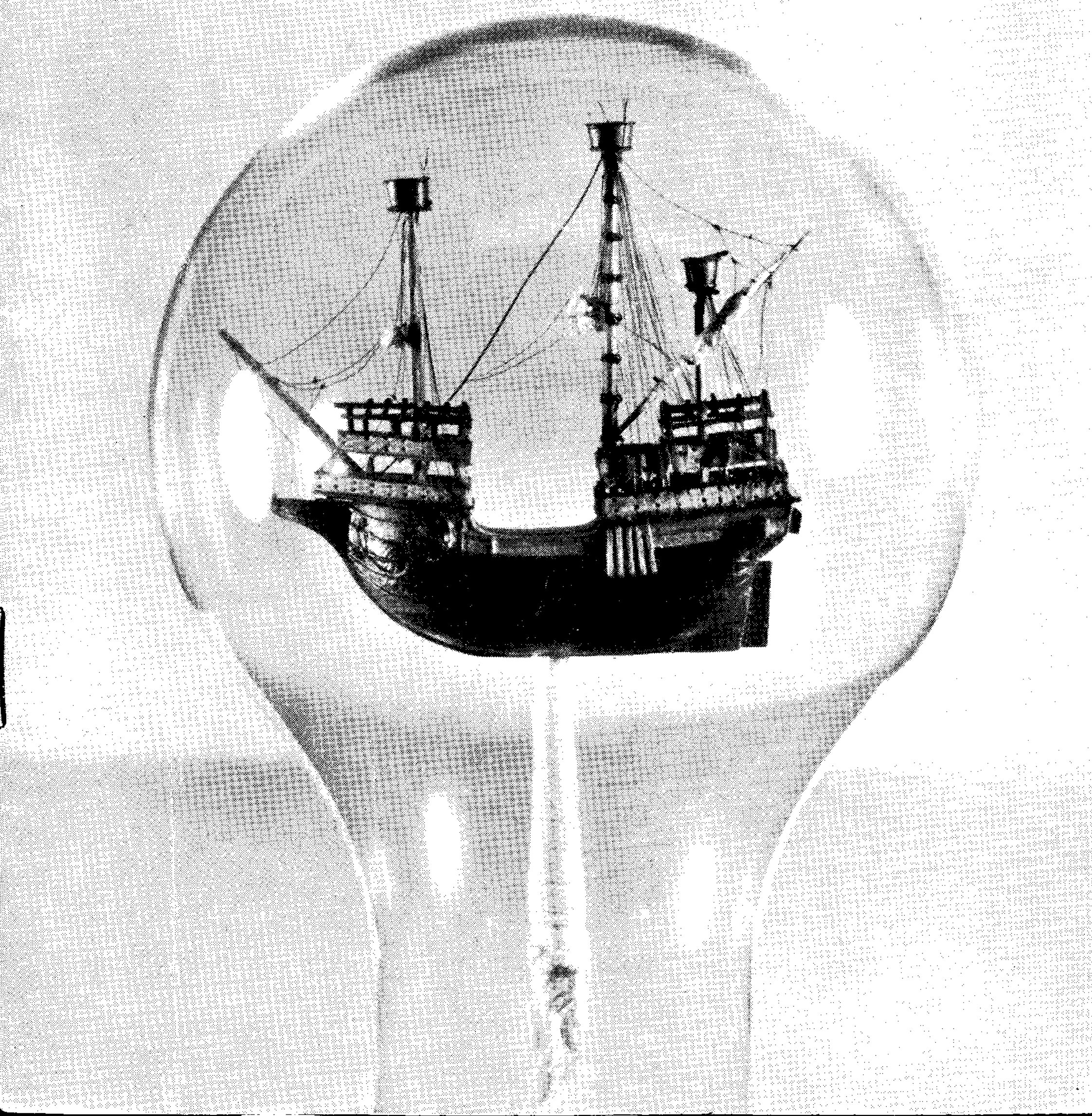


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

27TH OCTOBER 1949 VOL. 101 NO. 2527

SMOKE RINGS

Our Cover Picture

● THE PHOTOGRAPH we have reproduced on our cover this week was taken from the very intriguing model sent to the recent MODEL ENGINEER Exhibition, by Mr. C. Money, of Sheffield. The model represents a medieval carrack—one of the earliest forms of the three-masted ship. The model is roughly the same size as shown in the photograph and one can appreciate the delicacy of the detail work incorporated in it. The Very Highly Commended Diploma which the judges awarded it was well deserved. Mr. Money will be remembered for his fascinating model of H.M.S. *Victory* which he sent to the 1948 Exhibition. He can always be relied on to produce something out of the ordinary and his latest effort is one of his best. How he inserted it into the electric light bulb would make a good story. In this connection our readers will be interested in the book we have published recently on *Ships in Bottles.* This book gives away all the secrets of producing the ordinary model of this type, which is good value for 3s. 6d.

Models for Blind Boys

● WE HAVE received a letter from T. H. Turney, Ph.D. B.Eng., Beracah, Aughton, Lancs, who is interested in the education of blind boys, and has pointed out to us the value of models for demonstrating to them the shapes of objects which normally they would not be able to handle. For example, a blind boy cannot comprehend what the shape of a locomotive is; he does not know where or what the funnel is; these things could be explained to him quite easily by a simple model, as it is necessary to educate boys so that their sense of touch can be made to compensate, at least in part, for the lack of vision. An appeal is made to secretaries of model engineering societies and individual model engineers for the loan of models to a blind boys' school. Any old or discarded model might possibly be presented to the school as a permanent instructional model. The ability of a blind person to live a more or less normal life is very largely dependent upon a proper education, and many new ideas are now being introduced in schools for the blind. In the past, many blind persons have had to remain, practically for life, in an institution when, with proper education, they could have been taught to earn their own living in certain types of occupations. An example of the methods now used in educating and entertaining the blind, the "talking books" of St. Dunstan's, are fairly well-known, but it is clear that the sense of touch offers even greater scope in this respect than the sense of hearing, and the importance of models is, therefore, beyond question.

Exhibition at Grantham

● WE LEARN from Mr. S. L. Redshaw, hon. secretary of the Grantham Society of Model Engineers, that active preparations are in hand for holding an exhibition on November 17th, 18th and 19th. The venue will be the Co-operative Hall, St. Peter's Hill, Grantham.

One of the features will be an "Old Timers" Section, in which the models are to be not less than 25 years old, whether commercially built or otherwise. This should make an interesting show on its own, and we understand that four locomotives and a launch have already been unearthed for this section, but it is hoped that more will be found.

The Grantham society is one of the youngest and it is showing a commendable enterprise in organising an exhibition so early in its career; but the friendly co-operation of the societies at Nottingham, Leicester and Lincoln should result in a first-class show being organised.

When Winter Comes

● THE PAST summer has been one of the best that can be remembered by most people, in spite of long periods of drought, serious water shortages and unaccustomed heat. A very heavy programme of outdoor events organised by clubs and societies all over the British Isles is now drawing to a close, and only a very small number of these events have, this year, been spoiled by bad weather. From all reports we have received, it has been a most successful summer season, so far as model engineering is concerned. It is quite surprising to realise how much of our hobby can be enjoyed in the open air just at that time of year when most people seek to be out of doors rather than indoors. Model flying clubs, model power boat clubs, model sailing ship societies, model yacht associations and model locomotive track meetings have all reported good attendances this year, and there can be very little doubt that every club in the country can report an increase in membership as a result of the almost continuous fine weather.

And now the winter is approaching; what of it? Club secretaries everywhere are busy preparing programmes of lectures, discussion nights, annual dinners, film shows, dances and other events which usually take place during winter months. The weather is not, perhaps, so vital a factor in ensuring the success of meetings during winter, since it is seldom so bad as to keep everybody indoors.

The owner of a home workshop will, if he is wise, take the earliest opportunity at the end of the summer, to inspect all his workshop equipment and satisfy himself that all is in proper working order, so that he can proceed with his model making activities without any exasperating interruptions. For there is nothing more annoying to a model engineer than to start on, say, an elaborate piece of turning and then, after a few minutes during which the job seemed to be progressing satisfactorily, everything is brought to a sudden and unexpected stop owing to some adjustment which had been overlooked or forgotten. Of course, in well-regulated workshops, this sort of thing should not occur; and it need not if, at the beginning of the winter season, an hour or two can be given to nothing else but inspecting the workshop equipment and making sure that everything is in apple-pie order. Work can then proceed without much fear of hold-ups.

Kindred Spirits!

● THE FOLLOWING anecdote was related to us by a well-known model engineer who vouches for its accuracy, and we thought it sufficiently amusing to pass on to our readers, who will no doubt appreciate its significance. It concerns the resident dentist at a well-known mental institution, who happens to be a very keen model engineer. In the course of periodical examination of patients, it was remarked by other officials at the institution that the dentist alone appeared always to be on excellent terms with the patients, and in dealing with those who were known to have occasional tendencies to violence, he never found it necessary to take advantage of the regulations which provide for the presence of attendants in the consulting room, against any possible emergency. One of the officials, when dealing with a rather trying patient, asked "Why is it that you always give us so much trouble, and yet you always behave nicely for the dentist?" The answer came promptly—"The dentist—why, sir, he is *one of us*!"

An Unconventional Centre Engine

● MR. D. L. ALLEN, of Gravesend, writing to express his pleasure with the letters and articles in THE MODEL ENGINEER about showmen's engines, describes an extraordinary contraption which he has seen quite recently: apparently, it belongs to Messrs. Botton Bros. It consisted of a magnificent roundabout, absolutely glistening with new paint; but on closer inspection it proved to be, not an old one repainted, but a brand-new, post-war creation in which modern design had been scorned, and all the old traditional colours and shapes carefully reproduced. From the fascinating twisted brass columns to the really magnificent organ, true in tone as well as in looks, it was a perfect reproduction of one of the old type.

The amusing part was the splendid dummy steam engine taking pride of position in the centre. There was a perfectly-reproduced boiler with rivet-heads, water-gauge, fire-hole door, etc., all complete. Perched on top was a true-to-type cylinder, lagged in polished brass, with sundry brass pipes, lubricators and so on; a highly-polished brass chimney (something never seen on a real engine) was there, as was a solid-looking crankshaft and flywheel spinning round with the aid of a concealed electric motor. Surmounting it all was a polished brass name-plate bearing the name of no less a person than "General Buller."

But, magnificent though the effect was, there seemed to be something missing; and so it proved to be, for there was no piston-rod, connecting-rod or valve-gear! Let us hope that the manufacturers may be disposed to correct this omission on the engine and on any further engines they may build.

Building a 4-in. Centre Lathe

by G. A. Williams

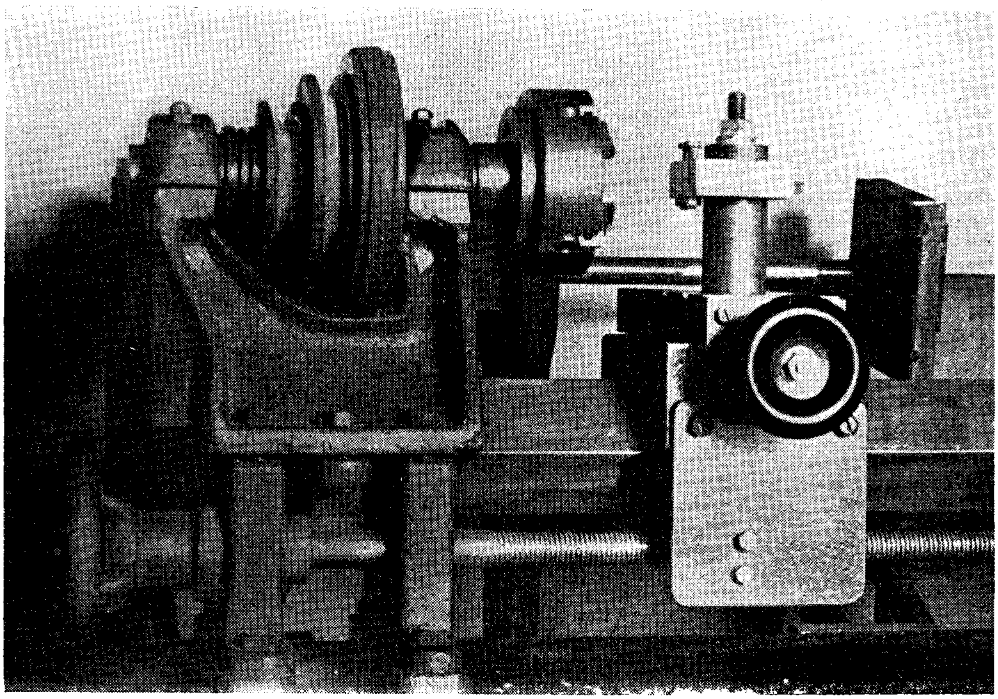
IN a previous article, " L.B.S.C." mentioned a correspondent who wanted to build a locomotive with only a capital of £20 to equip his workshop and build the locomotive.

I myself was in a similar position, except that instead of a capital of £20 I could afford only a few shillings per week. To build a locomotive a lathe was essential, and after looking at several second-hand ones that wanted almost rebuilding, I finally decided to build my own.

The locomotive I had decided to build was a 1-in. scale 0-4-0 industrial saddle tank, and so the lathe had to be substantial enough to machine all the parts. I had no machine tools and so most of the machining had to be done with hand tools, and the following description shows how this was accomplished.

After much thought and calculation, it was decided to use a piece of 2-in. square bright steel bar for the bed. A piece of bar 3 ft. long was obtained, and was found to be parallel and free from twist, although not quite square, but as everything is individually fitted, this was no detriment.

The bar is arranged in the lathe with one corner uppermost, so that the headstock, tailstock and saddle, fit on a vee. The patterns for the various parts were made and castings obtained off each pattern as it was made. All the castings were finished with a file and scraper to fit together, and this took considerable time and effort.



The headstock and saddle of Mr. Williams's lathe

The castings were then drilled and tapped and assembled on the bed.

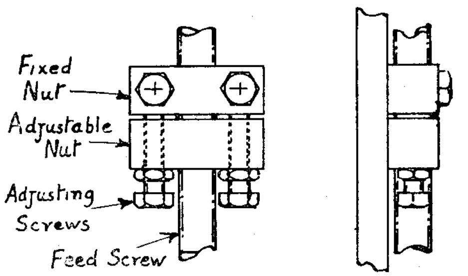
The headstock is clamped to the bed with six $\frac{3}{8}$-in. Whitworth bolts, four bolts go into two castings which form feet and the other two go into a clamp under the bed. At the opposite end, a foot similar to those under the headstock is clamped to the bed. Through the feet pass coach-screws to hold the lathe down on to a wooden bench.

The headstock casting had a cored recess for the bearings and when the bearing caps were bolted on, a rough hole approximately $1\frac{1}{4}$ in. diameter was in each bearing. The bearing caps were packed with 0.024 in. of shim stock in 0.002 in. and 0.004 in. laminations and were then ready for boring.

On new lathes for production work which I had seen installed, it was noticed that the mandrel

was offset from the centre of the bed; I incorporated this idea in my design by offsetting the mandrel 1 in. from the centre-line. The mandrel is $1\frac{1}{4}$ in. diameter in the bearings with a $1\frac{1}{8}$-in. diameter nose screwed 12 t.p.i. to suit Myford parts. The faceplate and chuck backplate were bought and are spares for a Myford lathe.

As I had no means of making the mandrel, it was made for me together with a pair of brass bearings to suit.



Method of adjusting backlash

A piece of $\frac{3}{4}$-in. diameter and a piece of $\frac{1}{2}$-in. diameter bar, both 42 in. long, were obtained to use as boring bars, the $\frac{3}{4}$-in. diameter for the headstock bearings and the $\frac{1}{2}$-in. diameter for the leadscrew bearings.

Two pieces of $\frac{1}{16}$-in. steel plate 4 in. $\times$ 9 in. were riveted together with copper rivets and in these plates square holes were cut to fit the bed and boring bars.

The plates were then separated and placed on the bed, one near the headstock and one at the opposite end of the bed.

in and the mandrel was free to turn without play, showing that both bearings were in line after the boring operation. A ball thrust-bearing together with a three-step wooden cone pulley were fitted on to the mandrel.

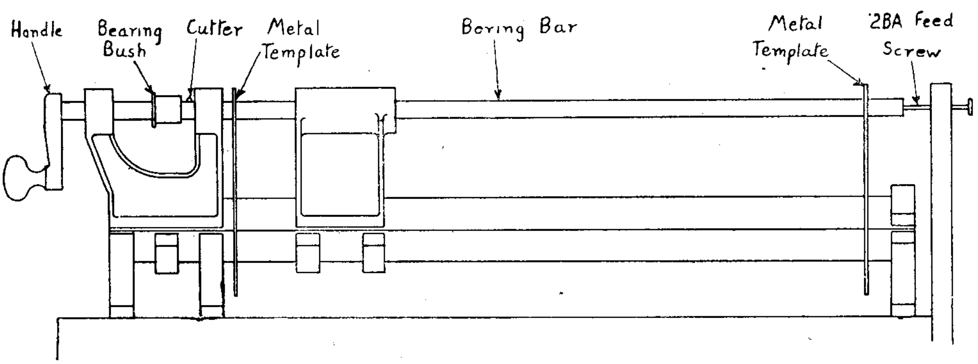
While the metal templates were still on the bed, the bearings for the leadscrew were bored. These bearings consist of brass bushes bolted to the bed-rest castings, one bush being drilled $\frac{11}{16}$ in. diameter and the other $\frac{9}{16}$ in. diameter. Using the $\frac{1}{2}$-in. diameter boring bar, these bushes were opened out to $\frac{3}{4}$ in. diameter and $\frac{5}{8}$ in. diameter respectively. After boring the bushes, the metal plates were sawn off.

The $\frac{3}{4}$-in. diameter bar used for boring the headstock bearings was screwed with a $\frac{3}{4}$-in. Whitworth thread, using a stock and die, for sufficient length to use as a leadscrew.

The saddle consists of two castings bolted together with a piece of steel plate and a piece of bright steel bar. The two castings were fitted to the bed and each is held with a clamp. The bolts holding the clamps and castings together are fitted with brass locking-plates so that adjustments can be made. The top surfaces of the castings were filed and scraped flat. The cross-slide is a spare for a Myford ML4, and was bought ready machined.

A piece of bright steel bar was filed and scraped to fit the vee of the cross-slide, and this plate was then bolted down to the saddle casting. The cross-slide feedscrew and nuts are screwed $\frac{3}{8}$ in. B.S.F. thread. One nut is screwed to the steel plate and the other nut is used to remove backlash from the screw as shown in the sketch.

The toolpost consists of a length of $1\frac{1}{4}$-in. diameter bright steel bar drilled to fit a $\frac{3}{8}$-in. diameter tee-headed bolt. To this pillar is fitted a clamp which holds $\frac{1}{4}$-in. diameter cutters.



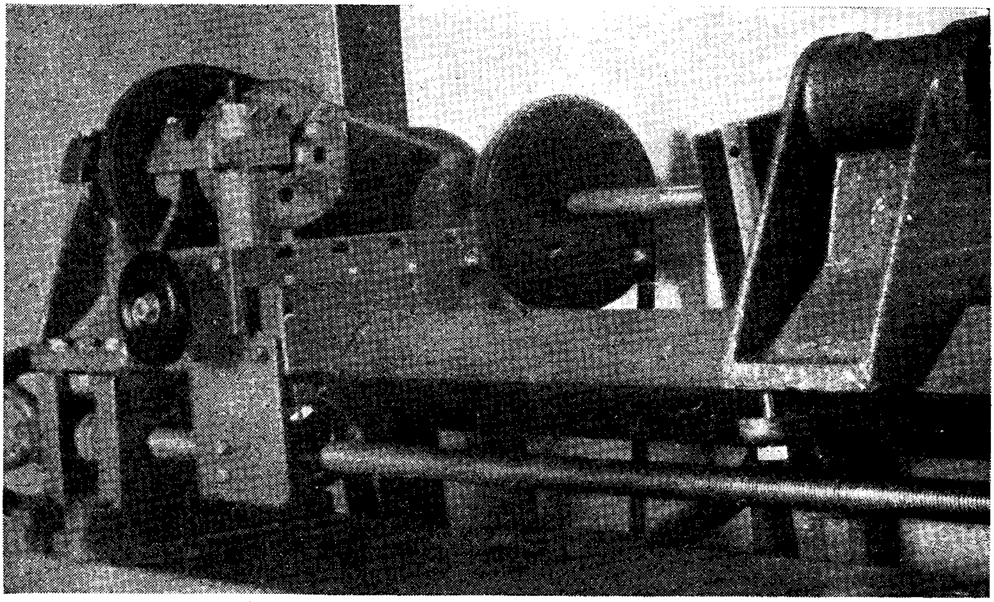
Method of boring headstock

The boring bar was placed in position and black-leaded where it passed through the tailstock and one headstock bearing. The tailstock and headstock bearings were cast full of lead which provided a good bearing for the boring bar. The sketch shows the set-up for boring, and by this method one headstock bearing was bored until the bearing brass was a push fit. The bored housing was filled with lead and the other bearing bored. When both bearing housings were finished, and the bearings and mandrel were pushed

As a new motor could not be obtained, a burnt-out $\frac{1}{4}$-h.p. motor was bought and rewound. This motor was fitted with wooden pulleys to drive a countershaft which drives the lathe. When this stage was reached, a four-jaw independent chuck was bought and fitted to the backplate, the lathe turning and facing the backplate.

To the present, from making the patterns, this has taken eighteen months, and has cost a few shillings under £10.

The tailstock is at present still unfinished but



A general view of the lathe

will be bored and the parts made by the lathe itself. A top slide is being made, for as well as completing the lathe, this will enable the tapered hole in the tailstock barrel to be bored.

For the past few months, work on the lathe has almost ceased, as the proposed locomotive has been started. Up to the time of writing, the frames are erected with axleboxes and buffers complete. The wheels are $3\frac{3}{4}$ in. diameter on the tread and these are finished together with the eccentrics.

The lathe was used for drilling all the rivet holes in the frames, of which there are 180.

For drilling work in the chuck, as no tailstock is available, the drill is put in the tool holder and adjusted for height.

The maximum diameter which can be drilled this way is $\frac{1}{4}$ in., but if a larger hole is wanted a boring tool is used to open out the hole to the required size. Height of centres, 4 in.; Between centres, 22 in.; Swing over saddle, $4\frac{1}{2}$ in. diameter.

For the Bookshelf

The Story of Sprowston Mill. By Wing-Comdr. H. C. Harrison, A.R.C.Sc., O.B.E. (London: Phoenix House Ltd.) 120 pp., size $5\frac{1}{2}$ in. × $8\frac{1}{2}$ in. Price 12s. 6d. net.

To many of our readers, perhaps, Sprowston Mill is known only because of the magnificent model built by the late H. O. Clark, of Norwich, and to be seen in the Science Museum, South Kensington. To those who are knowledgeable in the lore of windmills, however, Sprowston Mill was unusual, if not unique, in design and construction; it stood in fascinating rural surroundings, and its destruction by fire in 1933 was a major disaster, from the archaeological point of view.

Wing-Comdr. Harrison belongs to the family of millers who, for two hundred years, owned and worked Sprowston Mill, and his story is one that is of more than ordinary interest; it breathes authenticity, derived from intimate knowledge, and the reader, even if he is no expert on windmills, can hardly fail to enjoy every page of it.

Much technical detail is described and illustrated by well-produced isometric drawings and sketches, while a selection of photographic reproductions adds interest and significance to the more general points raised in the text. More than a smattering of the history of rural England, judiciously interwoven into the story, adds a touch of intimate and homely charm.

The text is written in a simple and straightforward manner, though a little more caieful editing, particularly with regard to the punctuation and the frequent intrusion of that non-existent word "onto," would improve it. The production leaves nothing to be desired, and the inclusion of a glossary of milling terminology is to be commended.

Sprowston Mill no longer exists, but its form is still with us in Mr. Clark's beautiful model, and its history will now be preserved in Wing-Comdr. Harrison's delightful book.

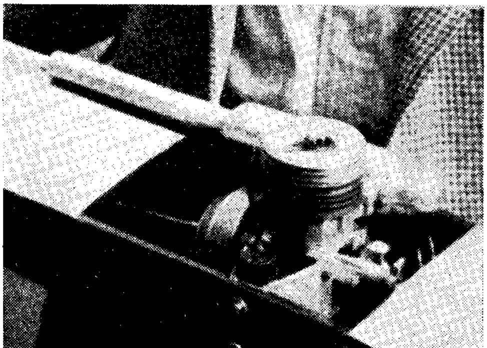
PETROL ENGINE TOPICS

Silence and Efficiency

by Edgar T. Westbury

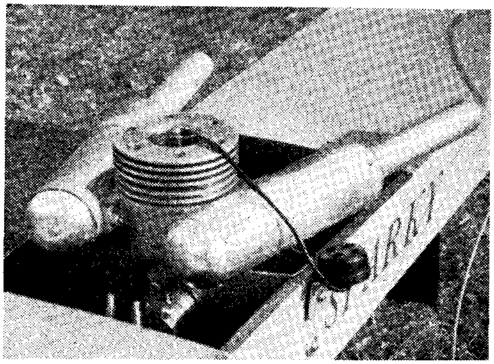
EVERY type of motive power engine has its own particular virtues and vices, its possibilities and limitations; it should be the aim of every intelligent designer and user of such engines to make the most of their good points, and reduce the objectionable traits. In the internal combustion engine, however, the two sides of its character appear to be inextricably interwoven in such a way that one can hardly be improved without accentuating the other. From their earliest days, i.c. engines, to everyone other than their devotees, have been noted much more for their vices than their virtues, and have earned various epithets, more or less polite, among which the adjective "noisy" is always included.

From first principles, it is clear that a certain amount of noise is inevitable in an engine which derives its motive power from a series of more or less violent explosions. It is, however, not the explosions in the cylinder which are heard in the majority of cases, as these scarcely ever succeed in reaching the outside world; the noise is caused by the sudden escape of exhaust gases at a pressure well above that of the atmosphere. The degree of exhaust noise produced by an engine depends on many factors, among which may be mentioned the pressure at which the exhaust gases are released to the atmosphere, their volume and frequency. It is a debatable point whether the actual explosions are audible at all, and it is difficult to put this to the test, as to do so would first entail the complete suppression of exhaust and mechanical noise; but in some engines the cylinders appear capable of acting as sound transmitters or resonators, to augment the total volume of sound produced. Be that as it may, however, it is a fact that nearly all i.c. engines are inherently noisy, and if no steps are taken to remedy this state of affairs, they are often regarded as a nuisance by the general community.



Mr. G. Lines's "Sparky" started its career with only one silencer—

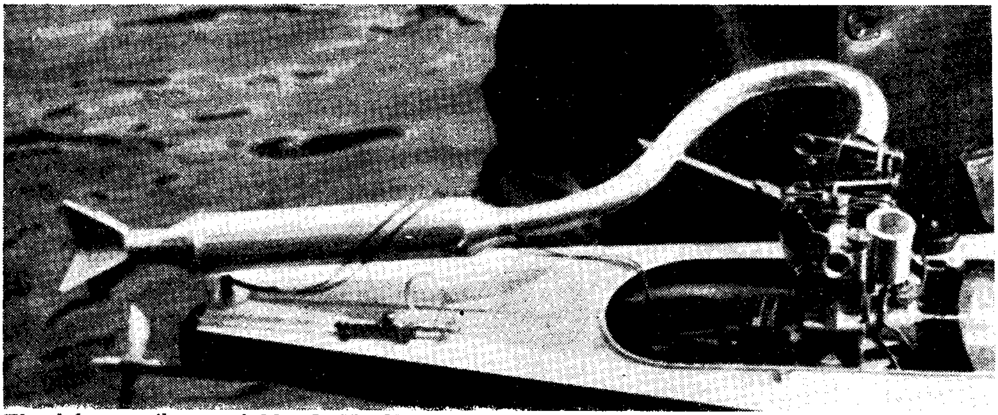
In the development of efficiency in i.c. engines, the methods adopted usually involve attempts to increase the internal pressure on the working stroke of the piston, by such means as increasing compression pressure, more efficient inlet porting and timing, and the use of fuels which enable the maximum amount of effective energy to be produced; also, to eliminate back pressure by rapid release of exhaust gases. It is obvious that any and all of these measures must necessarily tend to increase noise. Another factor in the development of performance is increase of speed, which, although it may not result in greater amplitude of sound, definitely makes it more conspicuous and aggressive.



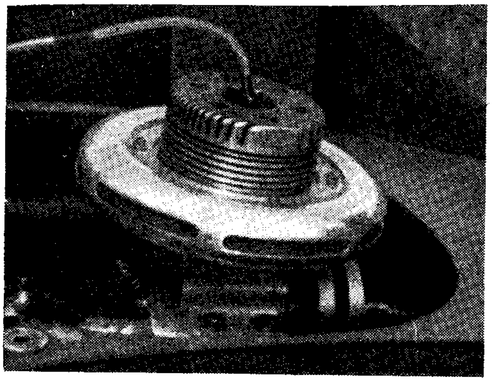
—but has now grown two!

The i.c. engine enthusiast not only accepts noise as an inseparable factor in efficiency, but often revels in it and regards it as an added attraction. Even people who have no real technical interest in engines may acquire the taste for the bark of the exhaust and come to regard it as rousing and exhilarating music, much as the Scot regards his beloved bagpipes (readers north of the Tweed, please note that no insult is intended!). That this plays an important part in the popularity of automobile and motorcycle racing, is beyond question, and as such is by no means to be discouraged; but there is reason to believe that sheer noise is often mistaken for efficiency, which is a great mistake.

Agitation by the public against the excessive noise of racing engines has often called for general or local restrictions on this form of sport, and this applies with equal force to competitive model sport where i.c. engines are used. In more



The elaborate silencer of Mr. S. H. Clifford's "Blue Streak" has often evoked speculation among non-technical observers as to whether the boat may be jet-propelled!

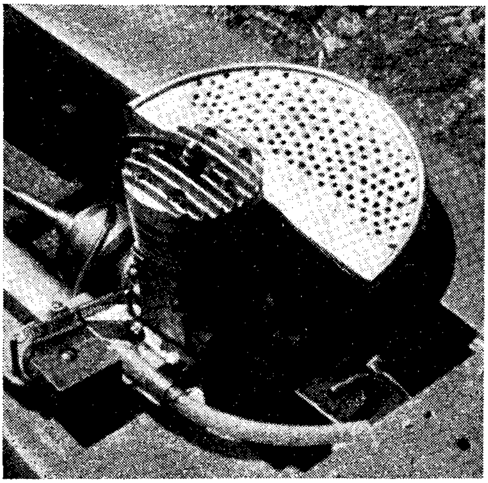


The highly unorthodox annular silencer of Mr. H. T. Meageen's "Samuel" has been designed to cope with all-round exhaust porting

than one case, a complete ban has been imposed on model racing for this reason, and it is high time that all the organisers responsible for model activities sat up and took notice of this real menace, not only to the popularity of model engineering, but possibly its very existence.

I have never agreed with those die-hard enthusiasts who set their faces against any attempts to "interfere with progress" by the introduction of restrictions on noise, or any other feature which is regarded dangerous or undesirable in model engineering. Restrictions, if discreetly applied, can do much to improve the breed, and actually promote efficiency rather than retard it. I am often told that I have much to answer for, on account of my efforts to popularise small i.c. engines, and should logically be the last person to side with those who seek to "fetter their free development." The latter, however, is a phrase more suited to the political tub-thumper than the technician, and the obvious answer to it is that there is a wide distinction between liberty and license. I confess that I have produced plenty of exhaust music in my time, and assisted others to make still more; I can revel in a good throaty exhaust bark with the next man—but one can have too much of a good thing, and I consider that many model racing engines at the present day have exceeded this limit. The appellation "ear-splitting," which one often hears applied to the sound of these engines is almost literally true.

Those who object to the adoption of any measures for reducing the noise of engines nearly always do so on the grounds that any interference with the exhaust system of a high-efficiency engine lowers its performance immediately. But conceding that this is generally (though not, I think inevitably) true, what does it matter if all who compete in this particular field conform to the required standards and are thus equally penalised? In every form of sport, restrictions and hazards are artificially introduced, just to make things more difficult, and thereby raise the standard of the game; why then should



The unorthodox silencer of Mr. L. S. Pinder's 10-c.c. boat has been facetiously described as of the "semi-lunar nutmeg-grater type"

we object to them in competitive model racing?

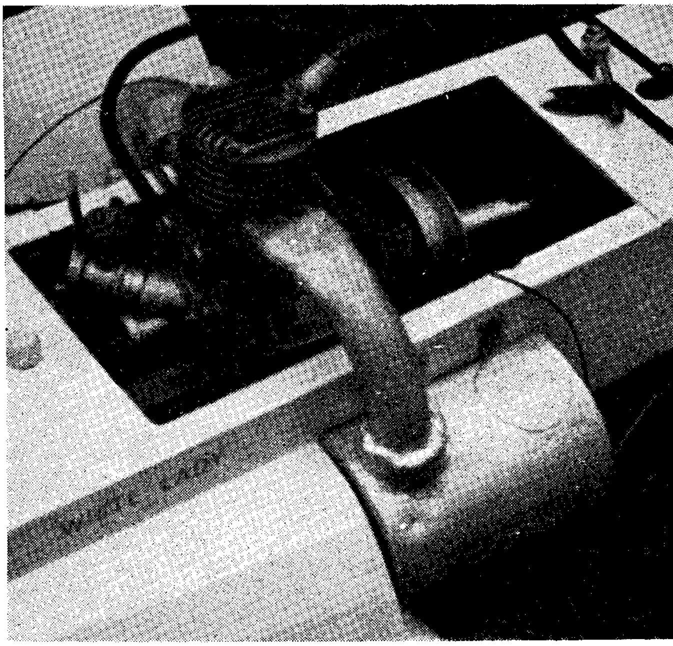
But the extent to which silencing lowers power output is often much exaggerated, and those who have tried it, either by choice or compulsion, have often been agreeably surprised to find that the practical loss is much less than the theoretical. One may sometimes knock a few hundred r.p.m. off the top end of the flat-out speed range, without making a great deal of difference to the power over the range of speed at which the work is actually done.

Principles of Silencing

I do not propose to give more than a general review of the silencing question in this article; the technical aspects of the subject, and in particular its application to small, high-speed engines, are as yet very obscure, and I am neither wise enough nor audacious enough to take upon myself the position of an authority on the subject. Silencer design is bound up inextricably with engine characteristics and design, and the perfect universal silencer to suit all engines would appear, on the strength of present evidence, to be a mere myth. All sorts of claims have been made for certain types of silencers used in full-size practice; some of them have been claimed to produce negligible back pressure, or even to create a vacuum, thereby actually improving engine performance. I make no comment on these claims; there is no doubt whatever that considerable research work and ingenuity have been devoted to silencer design, and many types are wonderfully effective for their primary purpose, at least; but it is rather significant that in general practice, silencers have not changed very much in their essential features since the earliest days of motoring.

Readers will, I trust, pardon me for stressing the obvious by stating that the term "silencing," as applied to i.c. engines, is only used in a comparative sense; the noise can, at best, only be very incompletely suppressed—though in the model world, we have many examples of engines which are all too silent except when they are very persistently disturbed! But seriously, one generally feels fairly well satisfied with a silencer if it reduces the aggressiveness of the sound, by blunting the peaks of the sound waves produced by the exhaust. In many cases a harsh crackle can be reduced to a much less objectionable "burble," and most important of all, the carrying power of the noise cut down considerably by fitting a suitable silencer. The majority of complaints regarding the noise of engines emanate from local residents who may be anything from 100 yards to a quarter of a mile away from the source of annoyance.

The principles involved in most kinds of silencers are extremely simple, though details of design vary considerably, and the construction may in some cases be complex. As the sound is caused by the impact of high-velocity gases on relatively still air, any device which reduces the speed of the gases before they escape to atmosphere will serve the purpose of a silencer

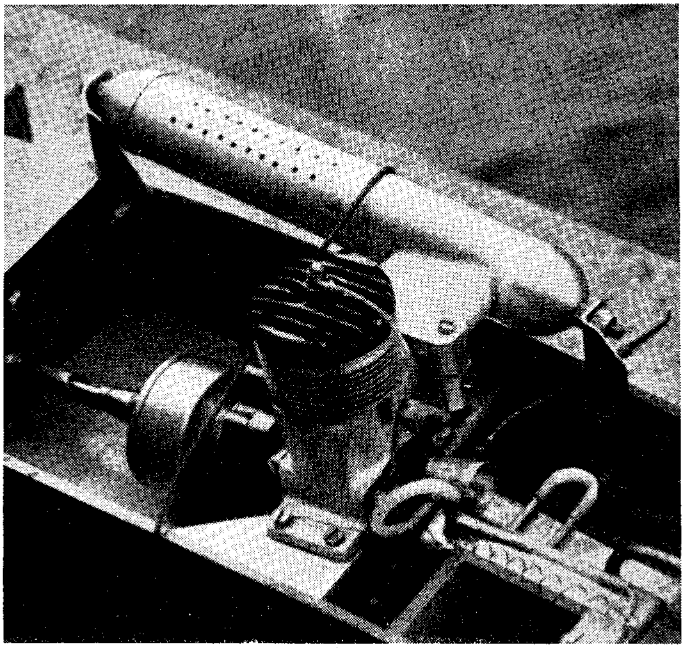


One of the twin silencers fitted to the Ensign engine of Mr. Pym's "White Lady"

more or less efficiently. The first essential is to reduce their pressure, which can be done by means of an expansion chamber of as large a volume as can be conveniently employed. The use of baffles inside the chamber will enable the gas stream to be broken up and diffused, with a great reduction in its velocity, but usually at the expense of some restriction and throttling. Nevertheless, silencers of comparatively crude design, with internal perforated baffles, labyrinth passages, or steel wool packing ("pot scrubbers") are very effective, and have been the most popular for all engines except those employed for racing purposes.

The latter demand much more finesse in the design of the silencer, and various designs intended to slow down the gas stream without introducing undue back pressure have been introduced. One complication in the design of the silencer is the tendency of the exhaust pipe or expansion chamber to act as a resonator and thereby amplify the sound. This can be remedied

to some extent by the choice of material, and shape or method of construction. The Burgess type of silencer, in which the main passage is continuous and not baffled or restricted at all, cuts down the noise by absorption, in an annular expansion chamber filled with steel wool, which surrounds the exhaust pipe, the latter being perforated to allow free communication with the chamber. But many racing engines are fitted with a silencer consisting of nothing more than a plain expansion chamber, which is often regarded as the best possible compromise between no silencer at all, and an effective silencer which reduces engine power by creating back pressure.



Mr. E. Clark's 10-c.c. boat has sometimes been mistaken for an M.T.B. by reason of the shape of the silencer

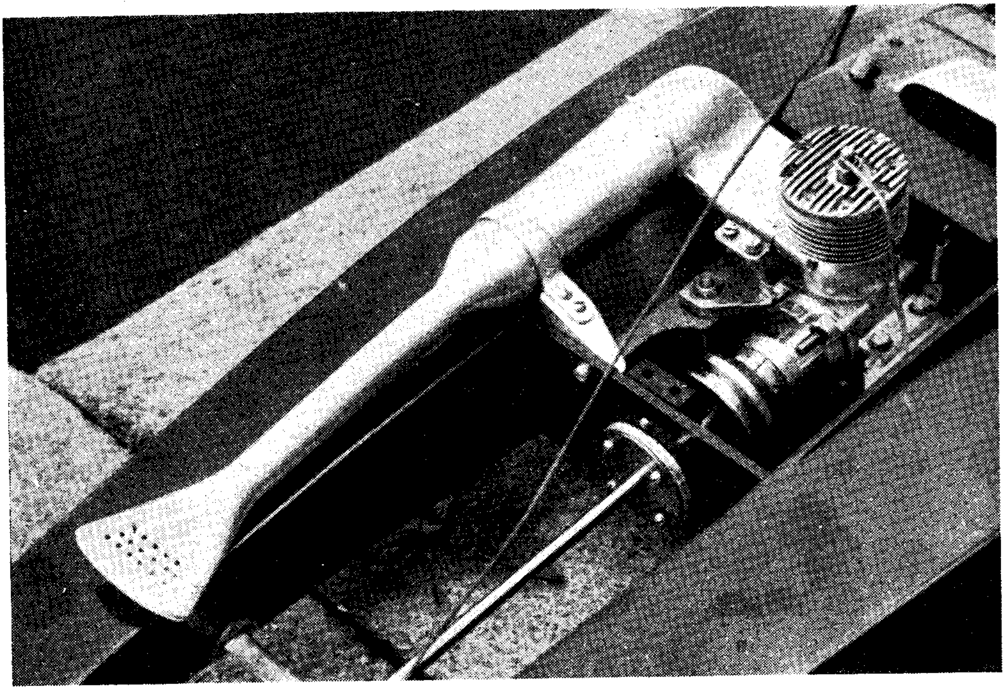
Available Experience

During the last two or three years we have heard a great deal about "silencing campaigns," and many users of i.c. engines have regarded this idea as something entirely new. It may be advisable, therefore, to point out that the need or desirability of reducing engine noise has long been appreciated by discerning users, and measures to do so have been taken by clubs and organisers of competitive events. Long before the war, silencing regulations were in force in the South London Experimental and Power Boat Club, and a standard design of expansion chamber silencer was specified. This regulation worked quite smoothly in the club itself, but there was often some vague dissatisfaction among members who had to compete with those of other clubs where no such restrictions were imposed. But the real snag arose when members of visiting clubs to the South London regattas were required to conform with the local regulations; there were all sorts of protests and objections, and some of the visitors improvised weird and wonderful devices which were regarded with suspicion. It was even hinted that they were mere camouflage, or that they were designed to be automatically jettisoned during the first half lap of the race—as actually occurred on more than one occasion!

It is clear that to be really useful and effective, silencing regulations must be universally adopted, so that in inter-club or national competitive events, no competitors are any worse off than others. Since the war, the Model Power Boat Association, concerned about the increasing number of complaints about noise, and the banning of clubs from many ponds on this account, have decided to give silencing regulations a trial. The decision was, as expected, very unpopular in several quarters, but after two years there is every reason to believe that it was a very sound move, and the regulations are, generally speaking, working quite smoothly. Many competitors who grumbled about the trouble involved in fitting a silencer, and even more at the anticipated handicap in engine performance, have found that neither are as serious as they expected. Relations with parks authorities and the general public have improved, the attempt to reduce any cause for complaint being appreciated as a gesture of courtesy.

It was considered that a reasonably free hand should be given to competitors in the matter of silencer design, in view of the small amount of data available at present. Attempts to specify a standard design of silencer would only cramp design, and retard development. The requirements of engines vary enormously, and also the extent to which they can be silenced without seriously affecting efficiency. But every encouragement is given to the designer to produce the best possible results, by the awarding of special prizes for silencing in speed competitions.

In respect of the effect on performance, I have already remarked on the fact that this is less serious than anticipated; but it is even more significant that there has been no interference with the progress of engine performance generally—on the other hand, speeds in all classes of boats have risen sharply during the last year or two. It is not, of course, claimed that this is due to silencing, but one might well have expected that it would have caused at least a temporary setback. On one occasion, the silencing prize



Expansion chamber and fishtail fitted to Mr. G. Stone's "Lady Babs II"

was taken by the boat which put up the fastest time of the day, at something approaching record speed for its class.

The model speedboat fraternity have ever been true pioneers in the progress of things that really matter, and I sincerely hope that their example in this respect will be followed by other organisations in competitive model fields, such as aircraft and racing cars. In particular, the latter sport is already suffering in popularity among the general public on account of noise, and I understand that at least one model car track has had to be closed down for this reason. It is no more difficult to silence a model aircraft or car engine than that of a speedboat, and though some increased weight is entailed this need not be considerable, nor detrimental to efficiency.

The photographs of actual examples of silencers reproduced here are taken at random from a large number photographed during the past season; all, without exception, are individual in design and at least moderately effective. It will be noted that only speed boat engine silencers are shown, the reason being, of course, that hardly any examples of silencers on other forms of racing engines are available—though I hope they will be in the near future, when I shall be glad to bring them to the notice of readers. It will be evident, from the diversity in design and the various angles of approach to the subject, that silencing offers great scope for experiment. I have not had an opportunity of checking up on the weight of silencers fitted to boats—a matter which may be of great importance to designers concerned with obtaining the maximum power/weight ratio of models—but in the examples illustrated, which are mostly of 10-c.c. engined boats, I estimate that the silencer weights in most cases are from 4 to 6 oz.

The object of this article is to direct attention to, and stimulate thought on, this very vital problem, and should there be a demand for more information on its technical aspects, I shall be pleased to do my best to furnish it, subject to the limitations of data, to which I have referred. No doubt there are many arguments which can be advanced against silencers—well, let us hear them, and discuss all sides of the question in the true model engineering spirit. But let us remember that no progress is ever made by obstinate refusal to keep pace with the march of events, even if they are moving in a different direction to what we would like. One characteristic of the true model engineer is a highly developed sense of proportion—and that entails the ability to appreciate the other fellow's point of view, though, it may be diametrically opposed to his own. And therein lies the secret of good sportsmanship—which, I am afraid, is sometimes ignored or forgotten these days among those who profess to be interested in "sport" of various kinds.

The Derby Hydroplane Races

CONDITIONS were perfect for the Derby Model Racing Club's first open hydroplane events which were held on Sunday, September 18th, at Allestree Park—fine weather, little wind and calm water. Speeds, however, were unfortunately very low in the actual events compared with those obtained in practice laps, the chief sufferers being the 10 c.c. classes.

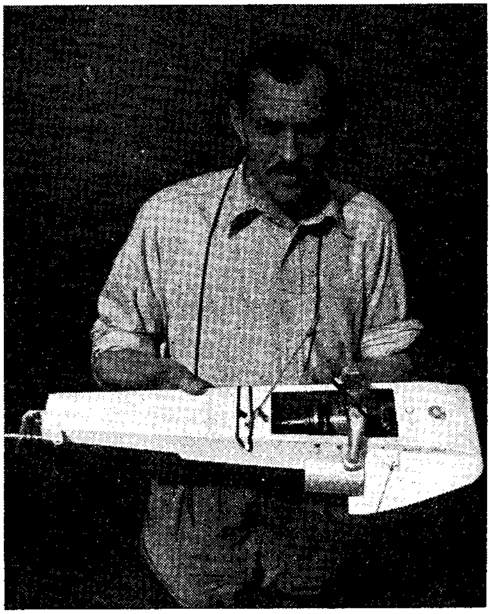
The first race was a club event over 500 yd. for hydroplanes up to 2½ c.c. for the Allestree Trophy.

	m.p.h.
1st. Mr. G. E. Jackson	26.63
2nd. Mr. E. Clare	24.00

An amusing incident occurred in this race when Mr. Pym's boat failed to take up the line. Mr. Pym waded out in an endeavour to stop it when the line suddenly became taut, and the boat, using Mr. Pym as a pylon, put in about ten very fast laps in decreasing circles, before breaking the line and careering headlong down the lake, finally colliding with a tree, fortunately with very little damage. Mr. Pym was eventually unravelled, and the race proceeded.

The next event was the open 500 yd. Class "C" (restricted) race for the Derwent Trophy.

	m.p.h.
1st. Mr. E. Clare (*Imshi*) Derby ..	31.66
2nd. Colin Stanworth (*Meteor IV*) Bournville	30.94
3rd. Mr. A. Brearley (*Bitza II*) Derby	28.00



Mr. Pym with his 10-c.c. hydroplane "White Lady"

All the boats in this event were suffering from a mysterious loss of speed. Colin Stanworth's *Meteor IV*, a brand new boat, clocked 43 m.p.h. on the maiden trip the previous day, and Mr. A. Brearley's *Bitza II* was consistently doing 50 m.p.h. a week ago.

The 500 yd. open Class "C" brought three entries. The only competitor to stay the course being Mr. L. O. Barnes (*Suna*) Derby, 26.56 m.p.h.

The last event was a club nomination and

Mr. L. O. Barnes with "Suna"

Concours for the Warren Trophy, 50 points being awarded for a correct nomination over 300 yds. and 50 points for workmanship, etc. In this we were extremely fortunate in having the services of Mr. K. Williams of Bournville and Mr. T. Dalziel, who awarded points for engine, transmission, installation, hull design, appearance and finish. Engines, if home-built, received a maximum of 15 points while a commercial engine received nothing.

	Total points
1st. Mr. L. O. Barnes (*Suna*).. ..	88.4
2nd. Mr. A. Brearley (*Bitza II*) ..	82

After tea at Allestree Hall, the prizes were presented by Mr. K. Williams. The Derby club would like to place on record their thanks to the Bournville club for their very welcome support.

A 3in. x 3in. Crosshead-type I.C. Engine

by Cliff Blackstaffe (Canada)

I'VE figured that the best way to aid a description of my engine would be to make a drawing of it. As always, after completing any machine, one can see something one wishes one had done. I drove both valves off the one eccentric and had to forgo the ultimate timing as a result, hence the drawing shows two eccentrics. The mixing-valve is a down draught with a $\frac{5}{16}$ in. venturi, and the floatless fuel-chamber is fed on the chicken-feed system. Of course, a pump and overflow pipe would be an alternative. The crankshaft is $1\frac{1}{2}$ in. diameter, as also the pin. This is excessively large, but I only hand oil it and can keep it clean at all times.

The guide bar has a trough at the bottom, and a comb to the lower edge of the slipper keeps this part well oiled and the engine clean.

To get to construction, the base was of cast-iron with the bearing channels cored in. The bosses for the columns and the seats of the bearing caps were faced off at the same cut. The crankshaft was set level by a bridge gauge, and white metal linings poured in place. The surplus metal was filed off and caps and liners bolted down and poured. In case some may think this a crude method, I might state that it is the standard practice in Canada, and I've known saw-mill engines that were built for 80 lb. steam and 85 revs. to be speeded up to 170 lb. steam and 125 revs. as a result of plant expansion.

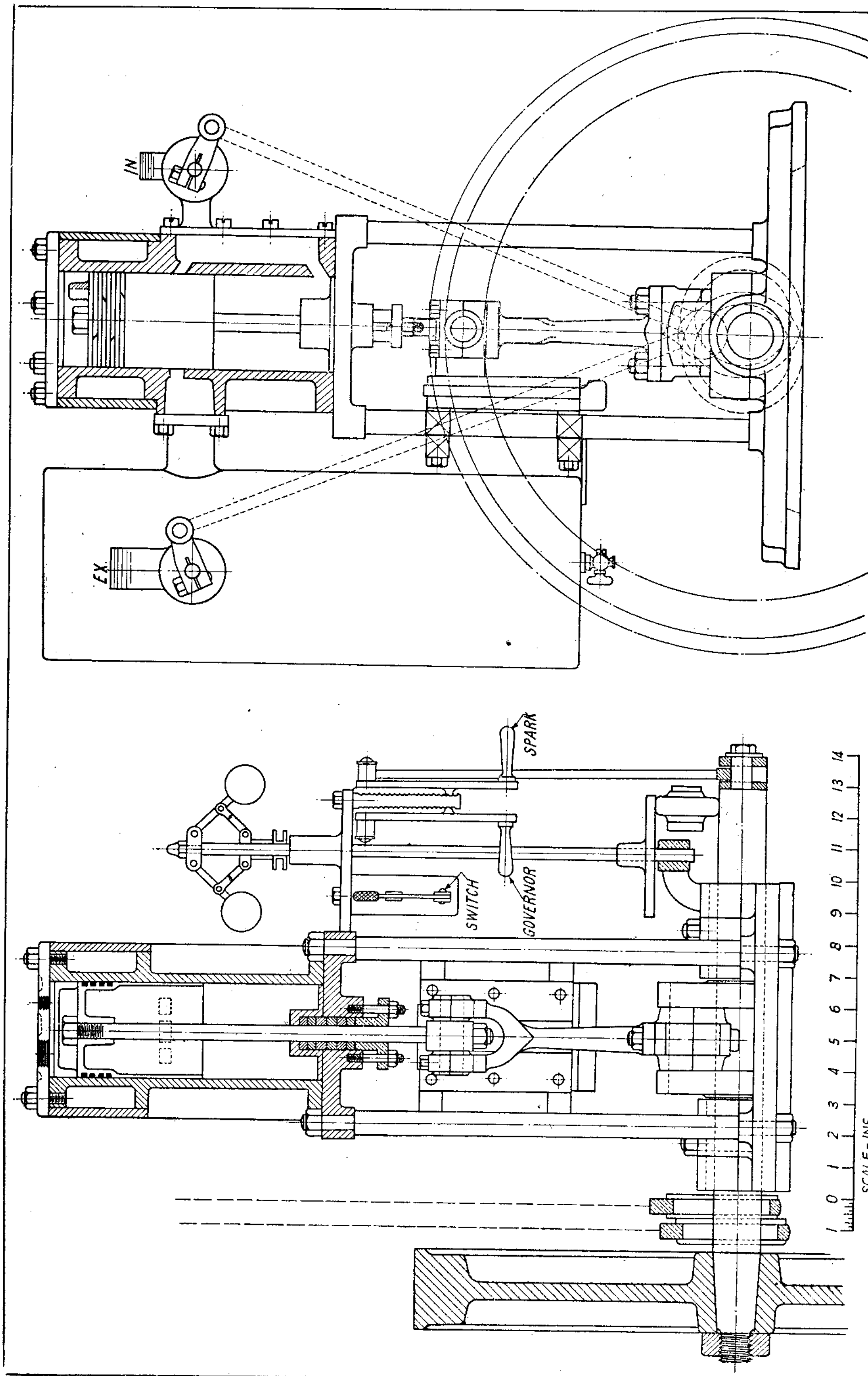
The crankshaft was built up and brazed, as my lathe would not turn the pins. The webs were made by boring $1\frac{1}{2}$-in. holes through a block of 2-in. × 2-in. bright mild-steel. This was then sawn in two (by hand), making two identical webs. Countersinks for brazing were made and the webs and pin mounted on the shaft and brazed. The centre position of the shaft was sawn out, the pin was cleaned up by hand, light cut taken off the shaft and flywheel taper-turned. The web faces were polished and the cheeks painted red. The front columns were round, in bright mild-steel, turned down each end to go through the lower cylinder-head and base, and threaded for nuts. The rear columns were in similar steel, but of square design with square faces left unturned, on to which horizontal square bars were bolted to carry the cast-iron guide. No planing or milling was done on the job, all work being carried out with lathe and drill press. The connecting-rod was made by welding palms on to a rod and machining, as for a forging. The double top end rod is the easiest to make and is, to my mind, the most perfect and prettiest type of rod.

The crosshead was built up of steel bar with a slipper screwed and brazed on the back and a wrist-pin brazed in. The whole was then machined up using the slipper as a base from which to work. The main guide was cast-iron faced off on lugs at the back and working face. Quarter-inch spacers and cover plates of brass were held on by six bolts from the back and tapped into cover plates, the same bolts holding guide to frames.

The lower cylinder cover was of cast-iron with a brass gland of the two-stud oval type. This cover should be clamped to the base and the column holes drilled through both at once to ensure column alignment. The gland must extend up into the cylinder, as a pool of oil always lies in the bottom and would run down the piston-rod, making a mess. The cylinder is an iron casting with the ports drilled and filed square after machining. It was bolted on the saddle and bored with a bar between chuck and tail-centre. On these long boring jobs (45 min. of treadling per cut) I found it desirable to have a book to read, it helps wonderfully. The cylinder was then chucked, centred as for boring, and the lower end faced. It was then bolted to the faceplate, the top end was faced and the two flanges turned to shrink on the 5-in. steel tube water-jacket. The cylinder-head is not water-cooled, and on slow speed engines like this, conduction does everything. It is finished in steam-engine style with polished edge and bolt face, and the centre painted black. A priming cap and spark-plug adorn the top. The steam fan can cover the latter to look like a relief-valve. The transfer port is a rectangular box cast on the side of the cylinder, over which is screwed a steel cover plate. The inlet-valve is a rocking-valve with a stern gland to prevent air leakage, and is up in line with the cylinder ports, so that on the suction stroke the oil which is injected into the carburettor inlet (by an "L.B.S.C." lubricator pump, ratchet-driven) may spray against the piston as it is swept up. The piston has a steel deflector screwed on.

The silencer is a bit out of the ordinary. It consists of an expansion chamber into which the engine barks, but at the moment of port opening the exhaust valve of the chamber is closed so that no sound emanates. When the crank has reached b.d.c. the valve begins to open. The exhaust then issues with a soft "woosh." I've taken the exhaust valve out, and it ran with a deep boom, but found no increase in power; so the device silences without loss of power. The inside of the chamber should be lined with asbestos and sheet iron to prevent the exhaust ringing in the metal. The drain is for condensation and oil which will accumulate. The governor spring control-lever and spark-lever are both mounted together on a double quadrant, alongside which is the ignition switch, the whole being mounted on the governor bracket. The contact-breaker is on the crank-shaft end. The governor is friction-driven through an intermediate friction wheel of rubber from the crankshaft. This was to get away from any noise of bevel gears. Yes, the noise of intake air going in is a nuisance and has to be led away; then the trembler on the Ford coil

(*Continued on page* 540)



Part sectional elevations of the crosshead-type internal combustion engine

The "K" Economic Boiler

by K. N. Harris

THE well known and well tried centre-flue cross-tube type of boiler is probably the most popular form there is for model marine work. It has the virtues of simplicity and robustness coupled with good steaming qualities. On the other side it must be set against it that a very large part of the heat supplied to it disappears up the funnel without doing any useful work at all.

Of course, as ever, there are two schools of thought on this matter. One says, in effect, "We can get all the power we want from the plain flue-tube boiler with a paraffin blowlamp, and paraffin is comparatively cheap, why worry about thermal efficiency?" That is a point of view which, of course, they have an unquestionable right to hold, express and work to. The other school of thought, which has my support, takes the stand that it is very much worth while to get the utmost efficiency out of its productions compatible with sound working qualities.

The boiler illustrated on the next page was designed to retain the good features of the plain centre-flue boiler, whilst mitigating its uneconomic shortcomings.

The boiler proper, i.e., the pressure vessel, is a plain straightforward centre-flue cross-tube job, but instead of the hot gases being led away straight up the funnel, they are, by means of a flue, directed along the bottom of the barrel to the front end where they divide and return to the uptake along the sides of the barrel.

In the flue, immediately in front of the furnace tube, is placed a hairpin superheater, and in the continuation of this under the barrel is a looped tube feedwater-heater. The outer casing is circular in form and lined with asbestos millboard to minimise heat losses as much as possible. There is a dome of substantial size at the front end of the boiler (or more correctly, perhaps, one should say, "at the firing end"), and contrary to normal practice, the boiler shell is not cut away beneath it, but left intact and perforated with a large number of 1/32-in. holes. This practice avoids weakening the shell or the necessity of fitting a reinforcing ring, and at the same time greatly facilitates the collection of dry steam. Steam is led from the side of the dome to the superheater header, the boiler stop-valve being located on the pipe close to the dome. It is anticipated that an engine stop-valve would be provided and normally used for regulation, the boiler stop-valve being left wide open.

Feed would be supplied via a clack-valve on the boiler front *above* water-level and fitted with a long internal perforated distributor pipe. The clack-valve and distributor pipe are mounted on a flanged fitting so that they can easily be removed, as internal pipes used for this purpose fur up very rapidly unless extremely pure water is used. As a matter of routine, this pipe should be removed and cleaned after 30 hours' running; of course, if it is found not be be furring up, then the periods between inspection may be increased accordingly.

It is strongly recommended that a water gauge of the one-piece end-held glass type be used, for in spite of attempts to deprecate this form of gauge, and highly imaginative *theories* about their shortcomings, they do in *practice*, give most satisfactory results.

A marine type safety-valve with closed body and escape pipe works well, and what is more, looks well and is correct practice. An injector may be fitted, but marine work is ideal for using a pump driven by the main engine, and this will probably suit most people.

Where desirable, a boiler of this type suitably constructed of the correct gauge of material, may be worked at quite high (speaking in "model" terms) pressure, say up to 150 lb. at least, but unless a triple expansion engine is in question, there does not seem much point in running at over 100 lb. for a non-condensing engine of any sort, and probably not over 80 lb. for a simple.

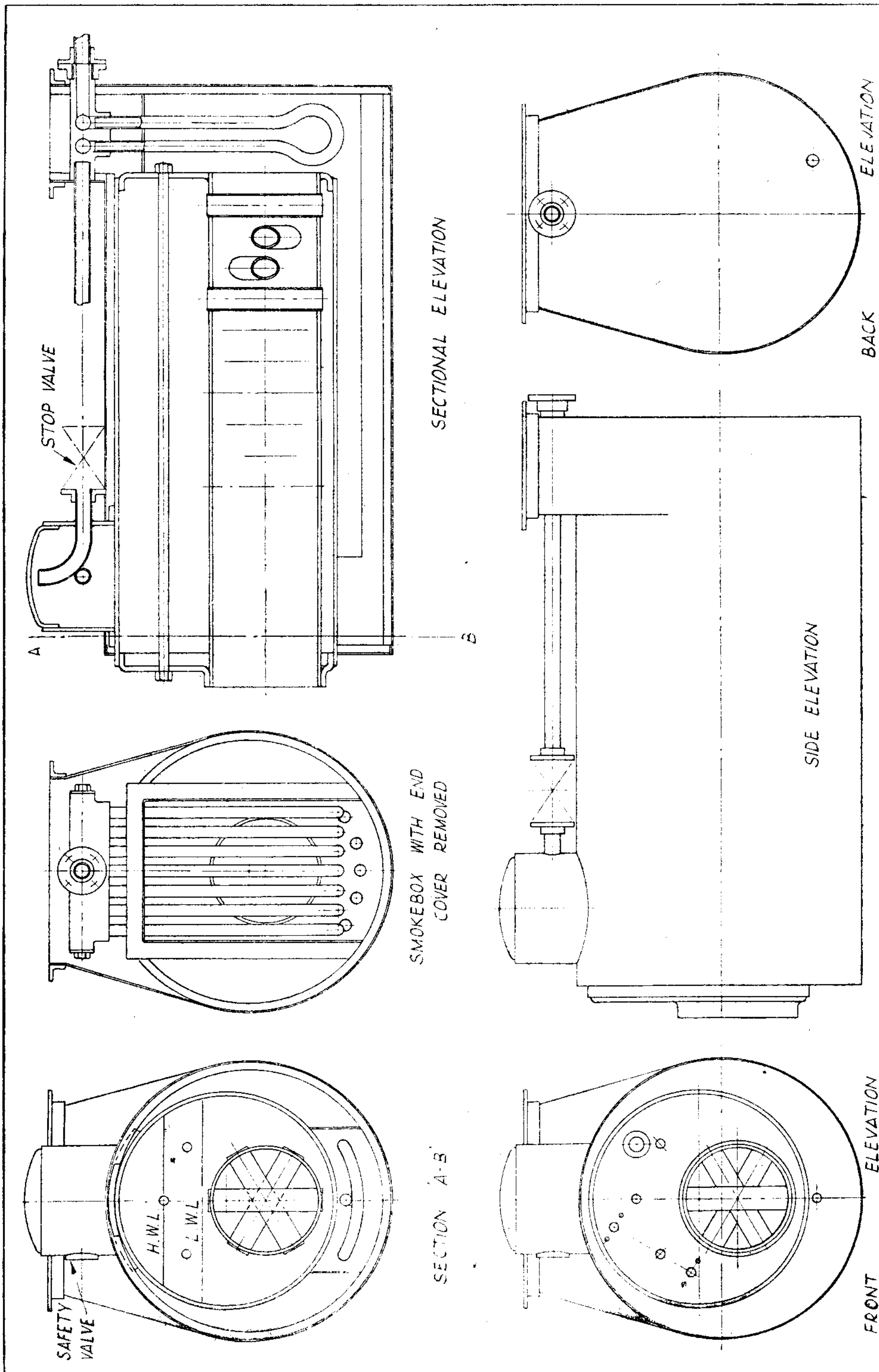
This boiler has a comparatively low centre of gravity, not quite so low as the plain centre-flue job, but low enough for all practical purposes, whilst its evaporative capacity is high. It will fit well into any normal type of hull and it is hoped that it may fill the bill for enthusiasts who are looking for something rather better than the reliable, but wasteful plain centre-flue job.

A Crosshead-type I.C. Engine

(*Continued from page* 538)

s heard, so that is put in a box. Then the ratchet can be heard clicking on the lubricator.

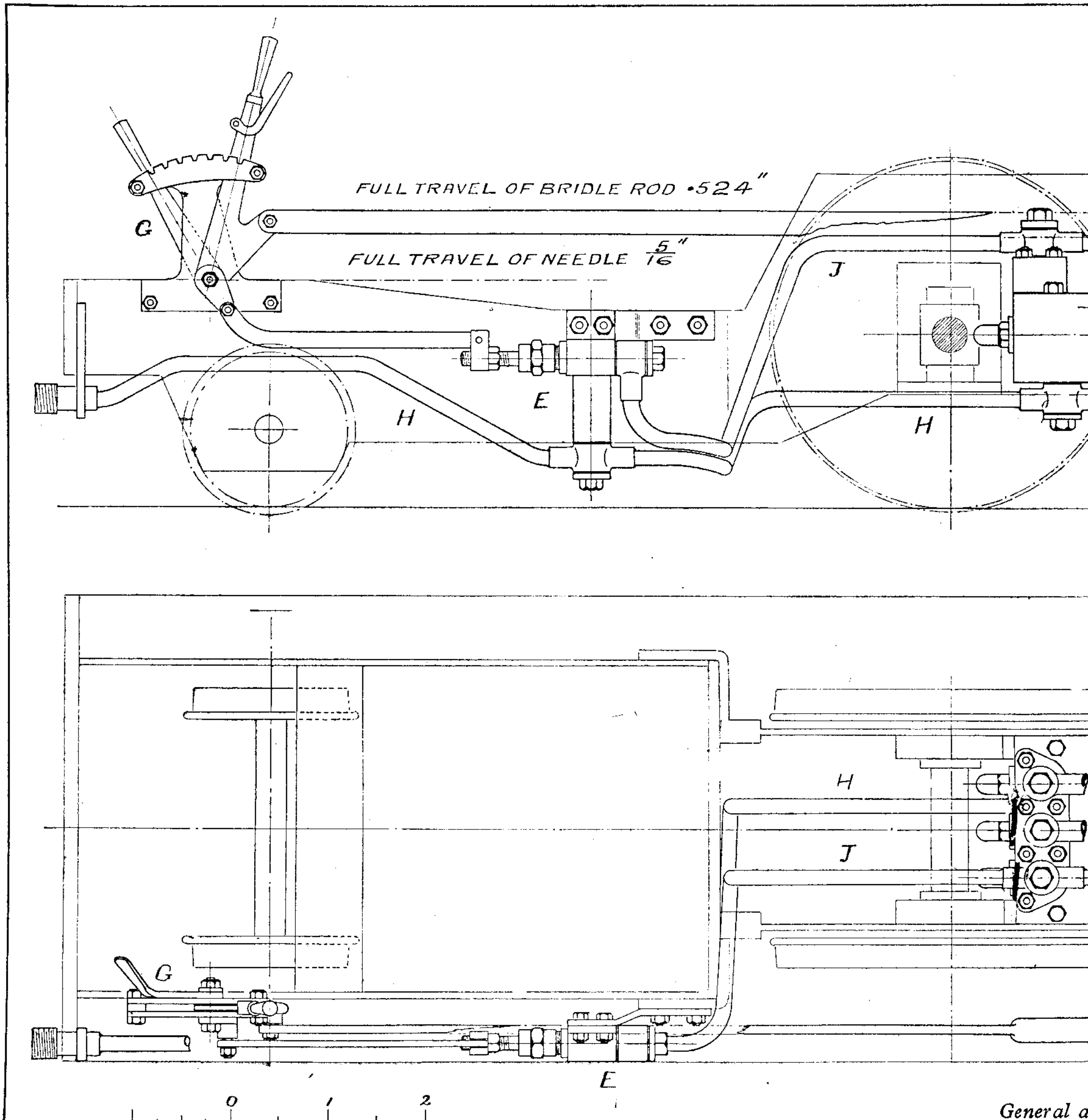
It usually runs around 200 r.p.m. and would slow down to 90 r.p.m. without missing on any load. It runs beautifully at 600-700 revs. but then develops far more power than is required. It was handy to the lathe and on stopping, say, for one minute I'd just reach over, knock down both handles to the bottom of the quadrant, and she would remain ticking over at 100 r.p.m. till wanted again. It rarely took more than two pull overs to start her when warm and four to five when cold. If I took the trouble to prime the cylinder when cold she usually started on the first pull over. On this type of engine no air can get in to spoil the mixture; there is no whirling crank to act as a centrifugal extractor of the petrol spray, and the high base compression giving positive scavenging, promotes sure firing of the charge.



Details of Mr. Harris's boiler design. (Note, **in** *the sectional elevation, the lines of the pipe should be continued to the superheater element)*

Automatic Expansion Control for L

THE previous article on this subject in THE MODEL ENGINEER for 16th December last has elicited kind enquiries for more information on the working and construction with more detail and drawings. The illustrations previously reproduced from photographs did not do much more than to show the location of the parts. At the time, I had only the setting-out drawings which were not in a suitable form for reproduction and their reproduction would, I am afraid, have left more to the imagination than the photographs. It has had its compensation in showing the degree of interest displayed in the gear and gives one encouragement to supply the fullest information. I hope that the following notes and drawings will help readers to follow



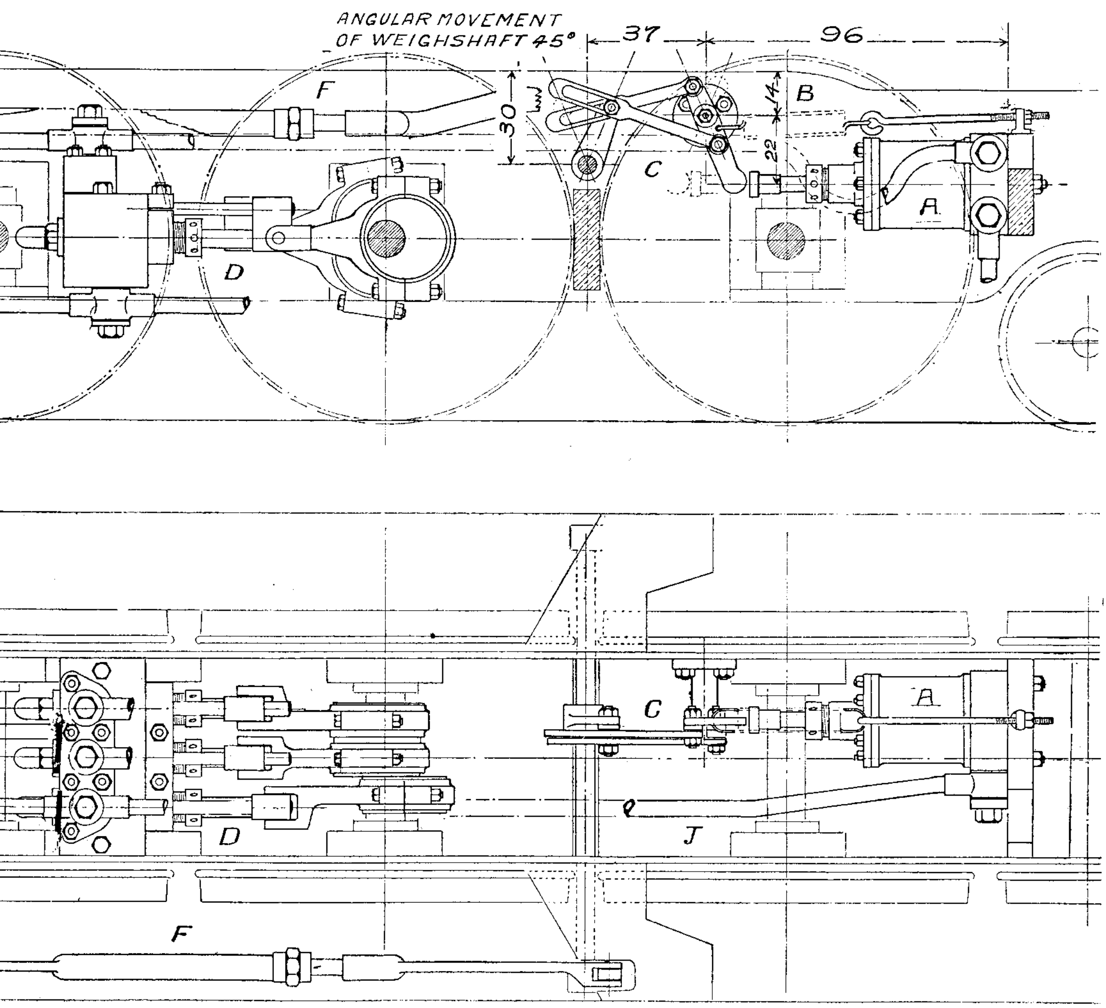
General a

for Locomotives

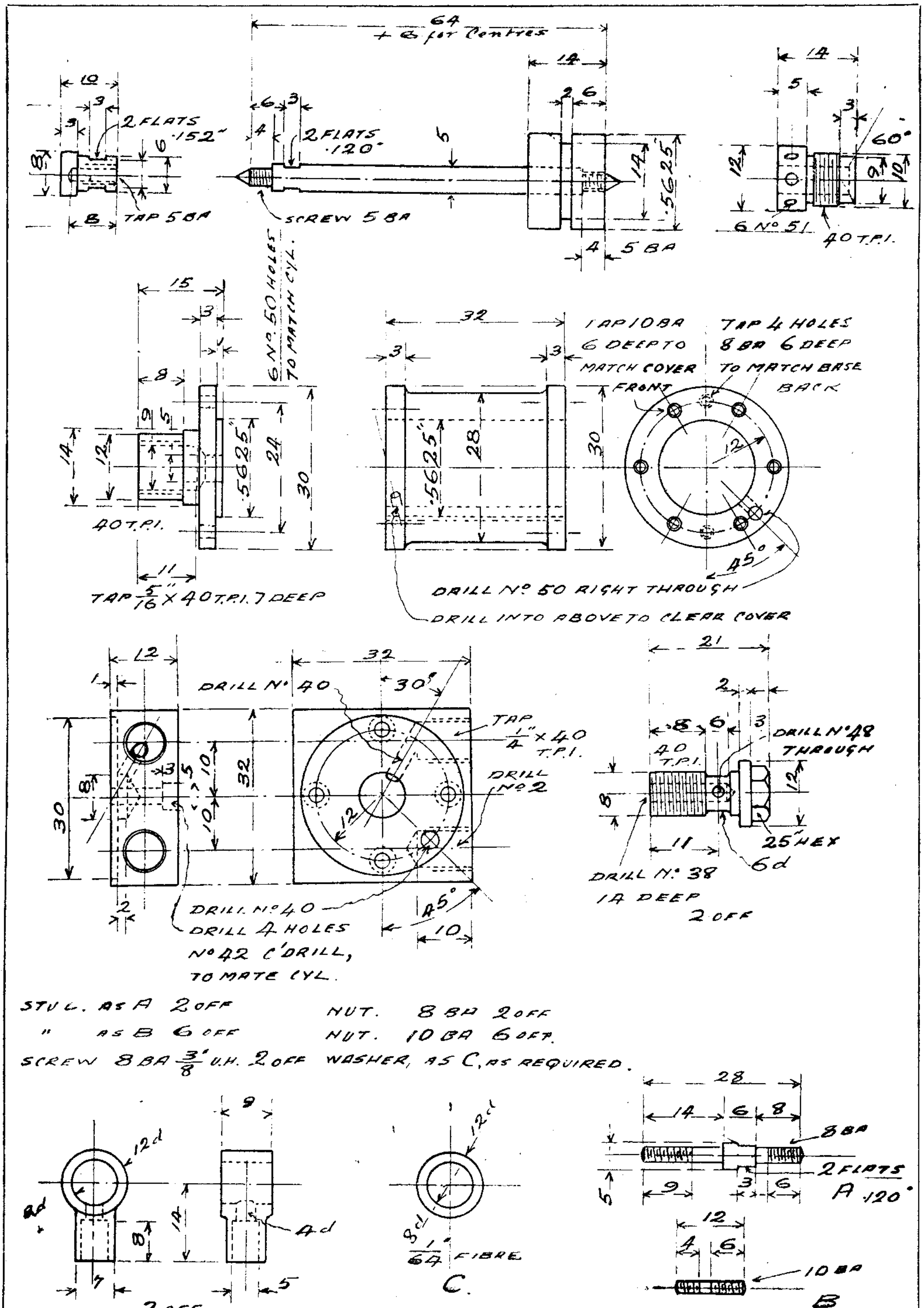
by G. Rhodes

out the working of the control and give sufficient detail for its adaptation to existing models if desired.

Before describing the layout and construction, it might not be out of place to theorise a little on the principles involved in the control. It operates as a form of governor, but instead of controlling the supply of steam through a steam valve, it varies the cut-off to keep the speed constant under change of load or power. Varying the cut-off ensures that the steam is utilised to the best advantage, and with this system the engine will always be running with the earliest cut-off for the power required. It is a first principle to obtain efficiency, which means economy, that an engine should work under a maximum range



General arrangement



Hydraulic cylinder details. Material—brass, 1 off each except as stated. Dimensions in 32nds of an inch.

of temperature, and since temperature and pressure are synonymous terms, the range of pressure should be a maximum. The most we can do with high-pressure cylinders only is to let the steam be at boiler pressure at the commencement of the stroke and cut off the supply as soon as possible, allowing the steam to expand as much as possible before exhausting. It is only by expansion that any degree of efficiency can be obtained. Without cut-off the steam would exhaust at the same pressure at which it enters, and would work as a non-expansible fluid, wasting all the internal energy of the steam. To be precise, steam can only do work by expanding; but without cut-off, the expansion is very small, being the amount to fill the cylinder as compared with the whole steam space in the boiler, piping and steam chest. Readers will, by now, be ready to "let off steam" as to why so much emphasis on expansion, and cut-off, and why worry about it on a model. Well, it is not unknown for even a model to fail for want of steam, and if there is a right and a wrong way of doing a thing, let us do it the right way and work on model lines.

The usual form of centrifugal governor, especially in a model locomotive where the size would be restricted, would not have sufficient power to operate directly on the expansion-gear, and would require to work through a telemotor and servo gear like the constant speed gear on an aircraft engine. Such a gear would be much too complicated to work out on a model. With this control we do the same thing, having the equivalent of a governor, telemotor and servo gear, capable of exerting all the effort required. The governor and telemotor are abstract, as they say on the radio, consisting of only a "hole"; but even a hole, I suppose, must have something concrete round it to make it a hole. However, that is what it is, a variable hole through which the water from the hydraulic cylinder, which constitutes the servo gear, can leak.

The concrete matter containing the hole is the relief valve, varying the size of hole by a taper needle. The amount of leakage determines the speed at which the engine runs. A force pump supplies water for the hydraulic cylinder, and, if there is any restriction in the relief valve, pressure will build up until the supply from the pump equals the flow through the valve. The pressure in the hydraulic cylinder will operate on the expansion-gear, increasing the cut-off, so varying the power and checking the speed. A quality in a governor is its sensitivity, that is, its response to change of speed, and so a few words on this may be of interest. Pressure varies as the square of the rate of flow, and since, in this case, the rate of flow from the force pump will be proportionate to the engine speed, the pressure will vary as the square of the engine speed. This means that with any change in engine speed, there will be more than a proportionate change in the hydraulic pressure, giving a quick reaction and so a high degree of sensitivity of the control.

Mention has been made in the first article, of the small amount of power absorbed, which is about 1/1,000 of the engine power, and such a figure should be well within scale for any form of governor servo gear.

Questions have been raised about the possibility of hunting, but even on the bench without the momentum of the movement of the engine, there has not been anything noticeable.

We can get down to the practical aspect and discuss the layout. In the general arrangement, the components have been labelled to correspond with the description in the first article, and there are a few additional labels to refer to other parts. To save referring back the complete key is as follows :—

A, the hydraulic cylinder.
B, the spring loading for the above.
C, the centralising linkage.
D, the force pump.
E, the relief valve.
F, the spring jigger.
G, the control lever connecting the relief valve.
H, the supply pipe from the tender.
J, the delivery pipe from the pump to the hydraulic cylinder and connecting to the relief valve.

The Hydraulic Cylinder

Details of this item are shown. Its function is a plain hydraulic ram, forced out by water from the force pump *D*, and returned as pressure falls by spring *B* and the spring jigger *F*. It works against the centralising gear lever through which the returning springs act. The only unorthodox feature is in the pipe connections. Two connections are fitted to the base: top, delivery from the pump, bottom, a leakage connection which can be led back into pipe *H*. By referring to the detail of the base, it will be seen that the top connection is drilled to lead to the back of the piston, whilst the bottom connection leads to the front of the piston by means of a hole drilled along the cylinder wall. This was done simply to save making a connection breaking out in front of the cylinder. One point in construction is perhaps worth drawing attention to, and that is the turning of the piston and rod. It will be noticed that the rod is turned with male centres. It is very important that the rod and piston should be true, and if a sized rod is used it is almost impossible, I find, to drill a centre hole true. By using female centres the rod can be trued up in a four-jaw chuck and the centres turned and will be true. The piston and rod should be considered as one piece, and if made as shown should be sweated together before sizing the piston. The front cover should also be true as to bore and flange, and this can be assured by machining the bore and gland first, and then mounting on a mandrel to finish the flange and spigot. The need for trueness would apply to any type of cylinder. Two special studs are fitted to mount the cylinder on to the forward front stretcher.

Spring B

This should be quite clear from the general arrangement and detail. It will be observed that its anchorage is by means of a nipple screwed into the frame stretcher. It can, of course, be secured in other ways if more convenient.

(To be continued)

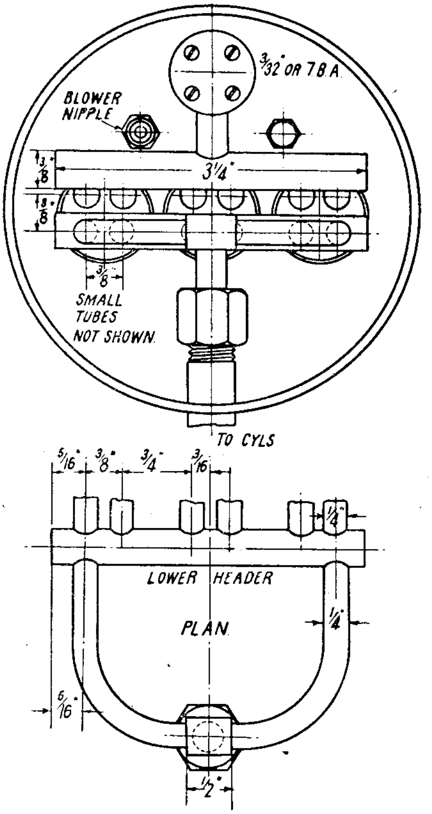
Superheater for New "Maisie" Boiler

by "L.B.S.C."

ONCE upon a time some good folk solemnly averred that a coil or a "gridiron" in the smokebox of a little locomotive, would be quite sufficient to dry out the steam, and any further heat imparted to it, would ruin the cylinder bores of brass or gunmetal cylinders. Well, fallacy No. 1 was, that if there were sufficient heat in the said smokebox, to do a spot of superheating, it is obvious that it wasn't being mopped up in the boiler, and therefore waste was going on. Secondly, if the heat *was* going into the boiler, then there couldn't be enough in the smokebox to do any superheating, so that the coil or gridiron merely became a useless "condenser," and the engine would have been better off without it. As to the cylinders, the only lubricators available at the time, were the "hit-and-miss" displacement lubricators, which usually allowed the cylinders to gulp all the oil, and then throw it out of the chimney, in the first two or three minutes of a run; so that the rest of the journey was performed with practically dry valves, portfaces, pistons and cylinder bores. Hot steam would have been fatal; and the only reason the engine kept going was because some of the steam condensed and provided "water lubrication."

As a correspondent recently pointed out in this ournal, we have progressed a little since those days; and if any of the "smokebox condenser" fraternity had taken a look at the reproduced drawing of a superheater that really superheats, he would probably have taken a single ticket to the loonies' home as well, unless the shock was too great, and caused a collapse on the spot! Anyway, it is the net result of some of my actual experiments, and is also just one more step toward full-size practice. As I have often pointed out, the only fundamental difference between one of my locomotives and its full-size sister, is the dimensions of the parts, and the rail gauge—excepting, of course, the few ultra-simple engines that I have described at intervals, which are merely glorified toys. We cannot actually adopt full-size practice, as Nature cannot be "scaled"; but getting as near as we can to it, within natural limits, and using full-size principles, allows us to build locomotives that will do their allotted task in full-size style.

When in the U.S.A. about ten years ago, I rebuilt a $3\frac{1}{2}$-in. gauge American Pacific engine belonging to the owner of a long ground-level line. This engine originally had a "condenser" in the smokebox. The tubes were fairly large, and I managed to get a multiple-element superheater in the top row. I forget now, how many elements I put in; but the difference it made to the performance of the engine, and the small

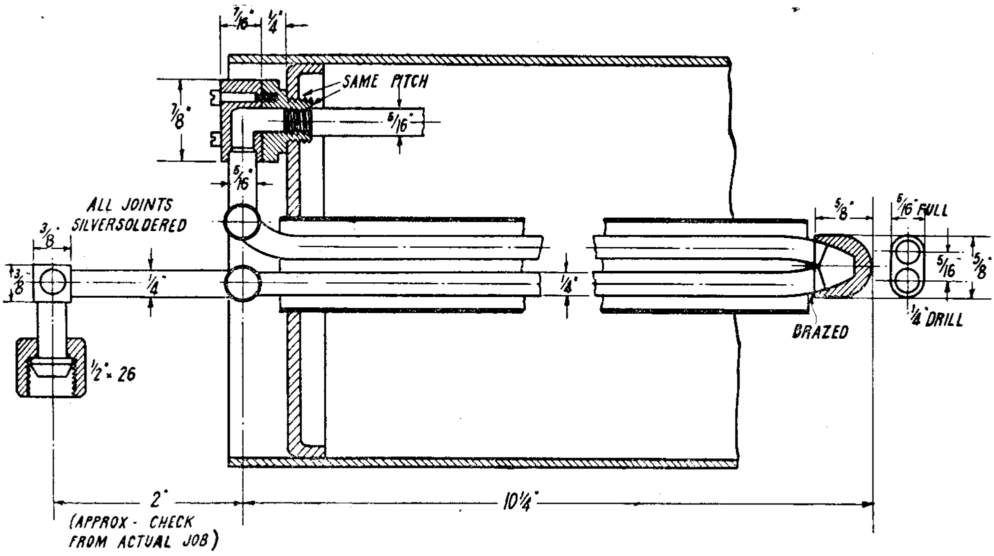


Headers and cylinder connections

amount of coal and water it used, compared with its original consumption, was just nobody's business. The superheater shown here, will be more efficient still, as it is housed in proper flues; so now to construction.

Elements and Headers

Full-size superheaters usually have cast headers, but we need not bother about castings, as the whole issue can be "fabricated" by anybody who can use a blowlamp or blowpipe. The elements are made from $\frac{1}{4}$-in. copper tube of about 22 gauge. Twelve pieces roughly 10 in. long, are required—incidentally ten feet of $\frac{1}{4}$-in. tube are nearly enough to make a "flash" boiler! Next, we need six block "return bends." These are made from blocks of copper, $\frac{5}{8}$ in. long, $\frac{5}{8}$ in. wide, and a full $\frac{5}{16}$ in. thick. They could be parted off a bit of $\frac{5}{8}$-in. square bar, held in the four-jaw, or sawn from a piece of $\frac{5}{8}$-in. by $\frac{5}{16}$-in. or $\frac{3}{8}$-in. flat bar. Square off one end of each, and make a couple of centre pops on it $\frac{5}{16}$ in. apart. Drill into the block at each point, with a $\frac{1}{4}$-in. drill, inclining same towards the centre of the block, so that the holes meet and form a blind cavity (see section). Round off



A superheater for really hot steam

all the corners and the end, with a file. There isn't the slightest necessity for a posh finish; it doesn't matter a bean how rough you leave them, as Inspector Meticulous can't see into the combustion chamber, and the efficiency of the job isn't affected in the least.

Leave the element tubes straight, and jam about $\frac{1}{8}$ in. or so of each into the holes in the block, so that they look like Winston Churchill giving the V-sign on all fingers at once; then braze up the lot at one heat. Note—NOT silver-solder for this job. Smear a little Boron compo paste, or similar flux, around each tube, blow up to bright red, touch with a bit of 16-gauge soft brass wire, or Sifbronze, which will melt and flow around to form a fillet. Then let cool to black, put them in the acid pickle for a few minutes, and wash off in running water. Let the water run through them, to flush out any bits of scale from inside the bends. The brazing job will have softened the pipes, and you can now bend them to come parallel, leaving about $\frac{1}{8}$ in. between top and bottom pipes.

The headers are made from $3\frac{1}{4}$-in. lengths of $\frac{3}{8}$-in. copper tube; same stuff as used for boiler tubes, does fine. Square off both ends in the lathe, then plug them with $\frac{1}{16}$-in. discs parted off a bit of bronze or gunmetal rod turned to a drive fit; or you can cut circles out of 16-gauge sheet copper. Set out the holes for the elements, as shown in the plan view, and drill them with a letter C or 15/64-in. drill; then open with the "lead" end of a $\frac{1}{4}$-in. parallel reamer, so that the tube ends will be a tight fit, tight enough to "stay put" whilst silver-soldering. Silver-solder will be quite all right for the pipe joints in the smokebox, as they are too far away from the fire, to come to any harm. The two end holes on the lower or "hot" header, can be drilled clean through, to accommodate the ends of the twin steam pipes. In the middle of the upper or "wet" header, drill a $\frac{5}{16}$-in. hole for the main steam pipe connecting the header to the flange; this should be at an angle of about 120 deg. to the element holes, as shown in the side view of the complete assembly.

Fit all the elements into the holes, leaving the upper ones straight. Also fit the two pieces in the lower element, which will form the U-bend as shown in plan; these should be about $2\frac{5}{8}$ in. long. The easiest way to make the bends, is to soften the end of a piece of pipe a foot or more in length; make the bend, which you can do with your fingers if your strength is normal, without kinking the pipe, then cut it off to length, and ditto repeato. The little bit of $\frac{5}{16}$-in. pipe, for connecting to the steam flange, can also be fitted. Then silver-solder the whole bag of tricks at one heat. No. 1 grade silver-solder, or "Easyflo," will do this job nicely; just cover all the joints with a paste made from powdered borax and water, or Boron compo paste, or if using "Easyflo," the special flux sold for use with it. Heat to medium red, touch every joint with the silver-solder (don't overlook the plugs at the ends), quench out in pickle, and wash off. Flush out as before. Then put a bit of rod down the short $\frac{5}{16}$-in. tube, and carefully ease up the header, until the elements have an upward set at the ends, as shown in the side view, and the $\frac{5}{16}$-in. tube is at right angles to the elements. This separates the headers sufficiently to allow a tube-sweeping brush to pass between them, although the flues will seldom, if ever, need sweeping. They keep remarkably clean on boilers with combustion chambers.

Flanges and Union

Now we must take a flashback to the original

" Maisie " notes. They called for a steam flange $\frac{3}{8}$ in. wide and $\frac{7}{8}$ in. diameter, which was attached to the boiler flange by three screws, and carried the ends of the two elements direct. In place of that, we need a flange the same diameter, but $\frac{7}{16}$ in. thick. Chuck a piece of $\frac{7}{8}$-in. bronze or gunmetal rod in three-jaw—brass will do at a pinch, but the former materials are better—face the end, centre, drill a bare $\frac{3}{8}$ in. deep with $\frac{1}{4}$-in. drill, skim off any burr, and part off at $\frac{7}{16}$ in. from the end. Drill a $\frac{1}{4}$ in. hole in the thickness, meeting the previously drilled one; open out the end for $\frac{1}{8}$-in. depth, to a tight fit for the $\frac{5}{16}$-in. pipe on top of the wet header. Drill the four No. 40 holes for the screws, and fit it to the boiler flange just-as described for the original " Maisie." Now cut the $\frac{5}{16}$-in. bit of tube to such a length, that when it is entered into the side hole in the flange, and the flange is in place, the elements will be nicely in the middle of the flues. This is a " trial-and-error " job, best done on the actual boiler. When O.K., remove the superheater bodily, and silver-solder the flange to the pipe; if you just play the blowlamp or blowpipe flame on the flange, and the bit of pipe just where it enters, keeping the flame off the header, you can do the job without risk of melting the previously silver-soldered joints.

Next, referring back to the original instructions, we find that the connection to the steam chests was made via a $\frac{1}{2}$-in. stand pipe, with branches to each steam chest, and a union for the oil supply. The top of the stand pipe was reduced and screwed $\frac{7}{16}$-in. by 26. This time, don't reduce it at all, but screw it $\frac{1}{2}$ in. by 26 for about $\frac{1}{2}$ in. down. Make a union nut to fit, from a piece of $\frac{5}{8}$-in. hexagon rod; ordinary screw-rod will do for this. We next need what our plumber and gasfitter confederates call a lining; this is a union cone with a stem to it, in which the beforementioned p's and g's fit their compo pipe or gas barrel. Chuck a piece of $\frac{7}{16}$-in. round rod in the three-jaw; copper is best for this, but bronze or gunmetal will serve. Face the end, and turn down $\frac{11}{16}$ in. length to $\frac{5}{16}$ in. diameter; part off at $\frac{1}{4}$ in. from the shoulder. Reverse in chuck, centre, drill through with $\frac{1}{4}$-in. drill, and turn $\frac{3}{16}$ in. of the end to a 60-deg. cone, same taper as a centre-drill.

For the tee connection, chuck a bit of $\frac{3}{8}$-in. square rod in four-jaw; set to run truly, face, centre, and drill down a full $\frac{1}{2}$ in. with $\frac{1}{4}$-in. drill. Part off at $\frac{1}{2}$ in. from the end; then, in the centre of one of the facets, drill a 19/64 in. hole, or use letter N drill, reaming slightly with the " lead " end of a $\frac{5}{16}$-in. parallel reamer, until the tail of the union fits very tightly. Assemble as shown, putting the piece of square rod between the two ends of the pipe forming the U bend, with the $\frac{5}{16}$-in. hole pointing downwards. Put the nut over the union cone or lining, squeeze the tail into the hole, and silver-solder the lot. After pickling, give the whole doings a good flushing through, letting the water go first into the flange end, and then into the union end. When every bit of scale, grit and dirt has been washed out, the elements can be inserted into the flues, and the flange at the top, connected to its mate on the smokebox tubeplate, by four 3/32-in. or 7-B.A. screws. Put a gasket of 1/64 in. Hallite, or similar jointing, between the faces, and don't forget to punch a $\frac{1}{4}$ in. hole in the middle, to let the steam pass. It is easily forgotten! When the boiler is erected on the chassis, the only thing to do, is just to connect the union nut to the stand pipe. It will be noticed that this arrangement of superheater allows the headers to stand clear of the blower union on the end of the hollow stay, so both headers are same length.

Minor Improvements

The slide-valve type of regulator that I specified for " Petrolea " could be used on an up-to-date " Maisie " with advantage, as it is of a little better pattern. The regulator described for " Hielan' Lassie " would also do; or a disc-in-a-tube pattern could be substituted, with a small pilot port opening before the main port. This would enable the engine to start a heavy load without slipping. It takes a mighty hard steady push to force a nail into a piece of wood; but if you " 'it it wiv an 'ammer," as our 'Oxton friend would remark, it goes in pretty quickly. The hamfisted amateur engineman, too often seen on club and exhibition tracks, apparently finds it impossible to open a regulator of the ordinary type steadily enough to prevent slipping. Same applies to the " handle-tappers." If, however, a small pilot port is provided, the engine won't slip unless they smack the regulator wide open.

The pump in the mechanical lubricator tank should be made according to my later specifications, for " Petrolea," " Doris," etc. with a gland on the pump ram, and the clearance recesses in the stand, instead of in the pump cylinder. This gives a better hold for the threads of the trunnion pin in the pump cylinder. Other small improvements in detail, will be found in the handbook, and incorporated in the blue-prints to be used with it.

" Grosvenor "

Followers of these notes say that I have often mentioned my L.B. & S.C. Rly. single-wheeler " Grosvenor " in these notes, but never put in a picture of her, or given any dimensions, or details of construction. Well, we can soon remedy the picture part of the business. Here she is, taken before she was finished, against a natural background, by Mr. L. J. Hibbert, Principal of the School of Photography at the London Polytechnic; she is standing on the curve at the north-east corner of my little railway.

There isn't a lot to say about her. Any older reader of this journal who recollects the full-size engines in their attractive colours, and usually as clean as new pins, will recognise the family likeness. I don't think even our good friends Messrs. Hambleton and Maskelyne, will find much fault with the outline or proportions—I knew every nut and bolt, so to speak, in the big ones, and needed no drawings—but such small alterations in details, or omissions of certain small components, are only in accordance with her " modernisation." As mentioned in a previous note, one night I had a very vivid and realistic dream, in which old Billy Stroudley himself came to my workshop, and had a long and

friendly talk with me about his engines. At the time, I was contemplating the building of a 3½-in. gauge tank engine, 263 "Purley," and had already made some parts for it; but when the dream Billy started talking about the main line engines, and mentioned "Grosvenor," I became interested. He said she could do with "Gladstone" cylinders, but the valves could not go

blocks and links move in opposite directions, "one up and t'other down," when the lever is in the middle, or close to it. This does not affect the running in the slightest; and as the beats are inaudible when she is well under way, there is nothing to complain about.

There is a mechanical lubricator with a 3/32-in. ram between the buffer beam and the cylinder

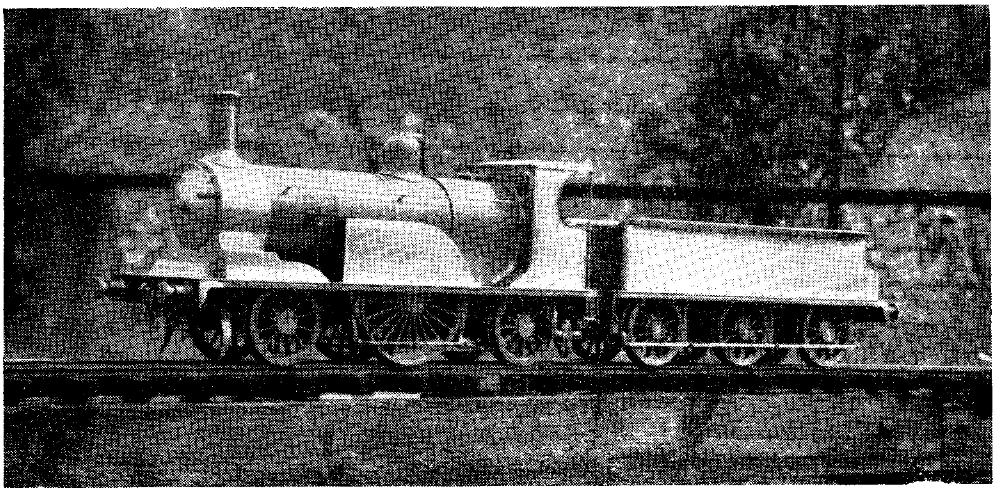


Photo by] [*L. J. Hibbert*

L*ook* **B***rothers and* **S***ee* **C***urly's* **R***acehorse*

underneath, because of the leading axle, and would have to go on top, with a flat steam chest, and rocking levers, to avoid pitching the boiler too high and spoiling the appearance. Billy, by the way, was "dead nuts" on appearance, and his engines really were works of art. He also mentioned superheating, and said hot steam was all right if the lubrication was "force feed"; and added that an "inspirator" would be useful to feed the boiler when standing, if it could be made to work with hot water.

As I said before, the dream was so vivid, and so impressed itself on my memory, that I was enabled next morning, to recall it, and make notes of the suggestions. The results you can see in the picture. The engine is "to scale," being exactly one-sixteenth the size of her big sister; but the valves are on top of the cylinders, actuated by rocking levers as suggested, the die-blocks being attached to the lower ends of the levers direct. I used this wheeze in the "Maid" and "Minx," so there is a bit of the famous old engineer in those engines! Incidentally, this will account for the fact that she is slightly "off-beat" in next notch to middle. As there was no room for the weighbar shaft in the usual position over the motion, owing to the low boiler, I put it underneath, as in Billy's earlier 2-4-0's, with the lifting links pointing upwards. The lower ends of the rockers carrying the die-blocks, describe an arc like the letter U, when working, whilst the upper ends of the lifting links describe their arcs in the opposite direction (with an "h" on the end!) so that the die-

casting, delivering into a clack on the front of the common steam chest. This cuts out the need for the little "dope cups" on the smokebox front of the full-size engine, through which we used to introduce a shot of cylinder oil and tallow before starting from the shed, and occasionally when stopping at a wayside station. Also the displacement lubricator on the side of the smokebox, is no longer necessary.

The inside of the boiler is exactly the same as I fitted to "Jeanie Deans," with two big superheater flues and the usual nest of small tubes. The elements discharge into a common header, and the steam is so hot that the exhaust is invisible. As this boiler has the blower valve on the backhead, similar to the later full-size engines, there is no need for the blower valve on the side of the smokebox.

The boiler is fed by a crosshead pump similar to that on the big engines, and though the ram is "scale" size, ⅛ in. diameter, it will push the water right out of sight in the top nut, when the engine is hauling a load equal to 320 tons at an equivalent speed of 100 m.p.h. As the ram is screwed into the crosshead slide block, the pump body comes pretty close to the connecting-rod—there was only about ¼ in. clearance on the big engines—but it just clears. The connecting-rods are circular in section, like the big ones, with marine-type adjustable "brasses" made from hard bronze. In addition to the pump, you can see I carried out Billy's recommendation to fit an "inspirator," but it doesn't have to feed

(*Continued on page* 551)

Repairs and Modifications to a Baby Lathe

by G. A. Walter

A SHORT time ago the author acquired a 2-in. plain lathe, of pre-war manufacture, that had obviously known better days.

It was evident that, given the attention the manufacturer could not afford in view of the low price, it could be brought up to "scratch" and become quite a useful little machine.

As the mandrel nose had been damaged, it was decided to deal with the headstock and mandrel first.

The plain split headstock bearings were in good condition. Alignment of these bearings with the bed was checked by mounting a dial gauge on the tool post and running it along the bed against a length of silver-steel pushed through the bearings.

From this test it was found that alignment was reasonably good, although the centre of the bed showed signs of over scraping by an enthusiastic previous owner. This was corrected by careful scraping of the ends of the bed.

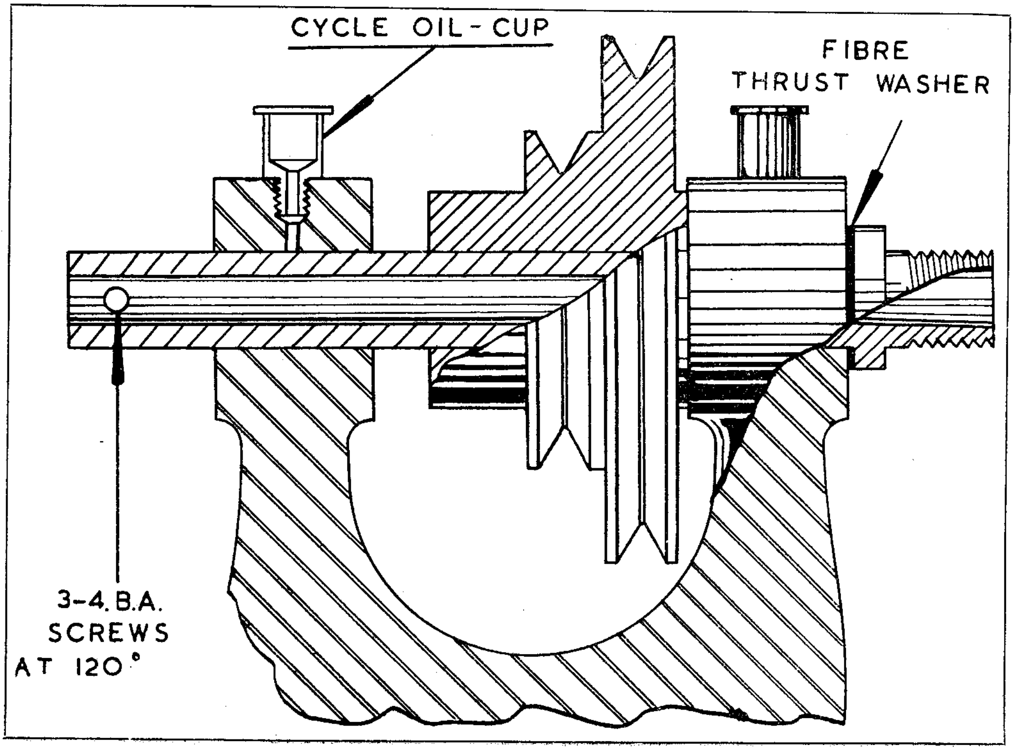
The small oilways in the bearings were opened out for a depth of $\frac{3}{16}$ in., tapped $\frac{3}{16}$ in. by 26 threads per inch and fitted with cycle oil-cups.

Consideration was then given to the design of a new mandrel. The old mandrel had a diameter of $\frac{1}{2}$ in. and was drilled to take bar material up to a diameter of $\frac{5}{16}$ in. The nose was screwed $\frac{1}{2}$ in. B.S.F. and bored "O" Morse taper. The mandrel did not project beyond the outer headstock bearing.

First of all it was decided to drill the new mandrel to clear $\frac{1}{4}$ in. material, thus adding 1/32 in. to the wall thickness, and increasing both strength and stiffness.

Secondly, the length of the mandrel was increased so that it would project $\frac{3}{4}$ in. from the outer bearing. This makes it possible to insert three equally-spaced set-screws in the end of the mandrel. By doing this, a back stop can be used—a highly desirable feature if any repetition facing or turning to length has to be done. If a long bar is being turned, the back and end can also be centred by these screws, thus preventing whip and causing it to run more truly through the chuck jaws.

An added advantage of this arrangement is that the smaller sizes of cast-iron locomotive wheels can be successfully turned on a baby lathe. By means of a handle, fashioned from $\frac{1}{4}$ in. round steel, slipped up the mandrel and gripped by the set-screws, the slow speed and ample



power required for turning cast-iron is there for the asking. Our old friend "L.B.S.C." mentioned this dodge in 1930 and, as usual, his advice is very sound.

The new mandrel, as illustrated, was now turned, and the nose screwcut between centres on the old and faithful 4-in. round-bed Drummond. It was then drilled to clear ¼ in. and the three 4 B.A. set-screw holes drilled and tapped. Before fitting to the headstock, a thrust washer of thin fibre was cut and slipped on to the mandrel behind the shoulder. Normally, on these small lathes, the thrust is taken by the mandrel shoulder running directly against the face of the headstock bearing. Much sweeter running is obtained by fitting a fibre washer between the faces, and once soaked in oil the washer becomes self-lubricating and lasts indefinitely.

It was now necessary to open out the mandrel nose to "O" Morse taper. The ¼ in. hole was opened out slightly for a short distance with a boring tool to give the reamer a true start. The "O" Morse reamer, supported by the tailstock centre, and held by a large tap wrench, was slowly fed into the mandrel until the required depth had been reached. Plenty of cutting oil was applied with a brush during this operation, and the reamer was frequently withdrawn to clear the swarf away. It may be mentioned here that, in the old mandrel, the nose had been opened out so much that only about 15 "thou" remained between the bore and the bottom of the external thread. By not feeding in the reamer quite so far with the new mandrel, this source of weakness was avoided.

By this time a suitable chuck had been obtained, and a backplate prepared for final turning. The backplate was screwed on to the mandrel and turned to size. Hopefully, the chuck was screwed to the backplate and the complete job run on to the mandrel. It was now found that the chuck had a small side "wobble" but ran truly in the "up and down" direction. This indicated that the spigot or register was concentric and true, but the face resting on the back of the chuck was "out." In other words, the mandrel was running truly, but had a certain amount of end play. By clocking to the front of the backplate, an error of 2 "thou" was found.

The cause of this error was soon run to earth. The face of the pulley running against the headstock bearing was not true with the bore, and the boss was eccentric. Also, both front and rear faces of the bearing itself were not true with the bore. These faults were soon cured. An odd piece of round stock was chucked on the Drummond and turned down until it was a push fit in the pulley bore. Without removing it from the chuck the pulley was pushed on and secured by its own set-screw. The boss ends were then faced and turned concentric. The front headstock bearing faces were then carefully scraped until the new mandrel and pulley would rotate freely without any trace of binding or end-play.

A light skim was then taken over the face of the backplate, clocked, and found to have a negligible error. On refitting, the chuck was found to be true, within very close limits.

Since the above work was carried out, the lathe, treadle-operated, by the way, has had considerable use, and output from it has included a complete set of "O" gauge locomotive wheels.

"L.B.S.C."

(*Continued from page* 549)

hot water, as no steam is returned to the tender. The exhaust is so light, that all of it is needed to "keep the home fires burning." The boiler is a wonderful steamer, and will blow off with the injector working.

The tender is a "regulation Stroudley," long and low, with a tool-box at the back. Full brake gear is fitted; the engine brakes have proper little cylinders and pistons at the bottom of the rear hangers, and if I can pluck up courage to tackle a Westinghouse donkey pump with wrist-watch works, they can be made to operate. Since the photograph was taken, the rest of the details have been added, including the working sanding gear. She is not yet painted, but I think I will have a shot at doing that job, my hand still being steady enough for lining, despite the passing of the years. She has a beautiful little pair of number plates, correctly inscribed "London Brighton and South Coast Railway, 326"; they are process blocks, made to a drawing kindly supplied by Mr. Hambleton, and are "the cat's whiskers."

Big sister was a grand engine, but the little one is better still, having the advantages of long valve travel, high superheat, and mechanical lubrication. She steams like a witch, and runs like a deer, gliding over the rails with no more noise than the clicking of the wheels over the rail joints; and the only visible evidence of moving parts, is the big balance weight bobbing up and down under the splasher. She has run nearly two miles on one firing, and the tender never seems to need refilling. I haven't tried how much load she will start, up to time of writing, as my railway has been out of commission, replacing the rotted longitudinals and re-laying the line over the replacements. I would dearly love to build a "C" class 0-6-0 to keep her company, maybe old 432, which I knew so well; but whether I shall ever manage to find the time, is something which is in the lap of the future.

*Traction Engines not so Well Known

by Ronald H. Clark, A.M.I.Mech.E.

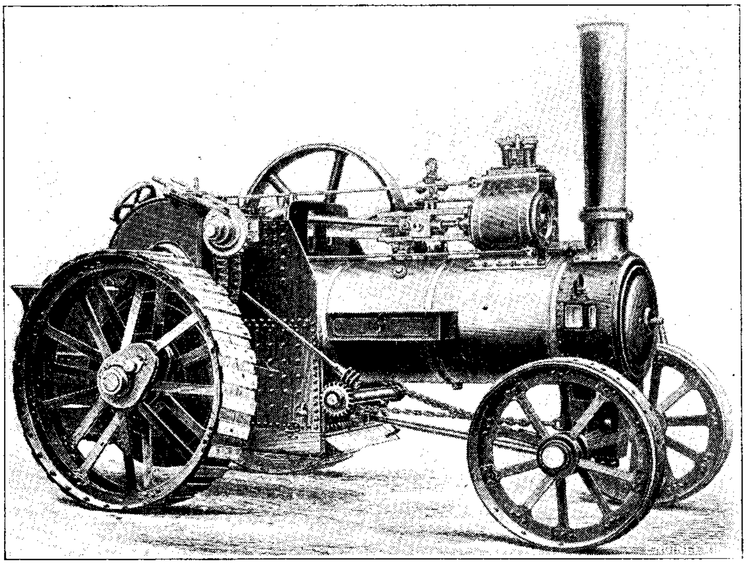


Fig. 50. General purpose traction engine by the Wantage Engineering Co.

XXIII—The Wantage Engineering Co. Ltd. Wantage

First, P. & H. P. Gibbons and afterwards Robinson & Auden Ltd. this firm ultimately became styled as above. Being situated in the Vale of the White Horse, they always fixed a transfer to their boilers depicting a white horse erect proper (not to be confused with the horse rampant used by Aveling & Porter Ltd., of Rochester), so that an engine from Wantage is easily recognised.

Their tractions were built on the three-shaft principle as seen in Fig. 50, with the high-speed crankshaft pinion on the outside, two speeds being provided. In many respects, a Wantage engine is similar to a Burrell, as a study of the cylinder block, hornplates, and flywheel will show. A fair number were made and a smaller example of 6 n.h.p. is to be seen in Fig. 51; this little engine exists in working order in in Suffolk and there are others in the South Midlands.

The leading dimensions of their standard 8-n.h.p. engine are as follow:

N.h.p. 8. Cylinder 9 in. × 10½ in. Flywheel 4 ft. 6 in. diameter × 6 in. face. Governed speed 160 r.p.m. Gear ratios 24 to 1 and 13 to 1 corresponding to 1½ and 3 m.p.h. Rear wheels 6 ft. diameter × 16 in. tread. Front wheels 4 ft. diameter × 8 in. tread. W.p. 150 p.s.i. Tubes 42 × 2 in. outside diameter. Water capacity 135 gallons. Overall length 17 ft. 3 in. Overall width 7 ft. 3 in. Overall height 10 ft. 3 in. Weight 10 tons.

Other details are: a cross-armed governor actuating an equilibrium throttle-valve, and a winding drum on the nearside equipped with 50 yd. of 1½ in. circumference wire rope.

Their single-cylinder road locomotive, very similar to the general purpose engine shown in Fig. 50, had a plated flywheel and a winding drum combined with the differential—another Burrell feature. To permit of this, the spur-ring is bolted to the compensating plate carrying the bevel pinions. One bevel-gear is keyed to the axle and the outer one fixed to the centre of the rear wheel by a pin. When the pin is withdrawn, the drum can revolve independent of the axle, being driven by the spur-ring, the pinions rotating freely on their own gudgeons.

XXIV—Wm. Weeks & Son, Maidstone

Known primarily for their agricultural implements they embarked upon the manufacture of a few traction engines—half a dozen, maybe—

*Continued from page 493, "M.E.," October 13, 1949.

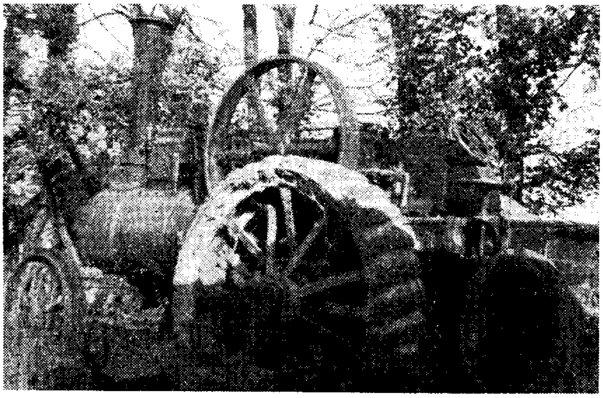


Fig. 51. 6 n.h.p. engine by the Wantage Engineering Co.

and one of them is shown in Fig. 52. They were sturdy machines employing a single cylinder, four-shaft transmission, a boiler having an ample reserve capacity of steam, double Salter safety valves, trunk guides and a large open-spoked flywheel for steady running on the belt. The offside end of the crankshaft was unduly long, as is the case in some Allchin engines, so that a pulley smaller than the flywheel can be fitted when required (compare Fig. 49).

The cylinder was steam-jacketed, the jacket terminating in a small flat dome above the valve-chest; in the dome were placed the safety-valve seatings.

Fig. 52 shows probably the last Weeks engine, which was working in South Lincolnshire until during the first war. If finished its days at Bourne where it was broken up.

XXV—Hybrids or " Bitzas "

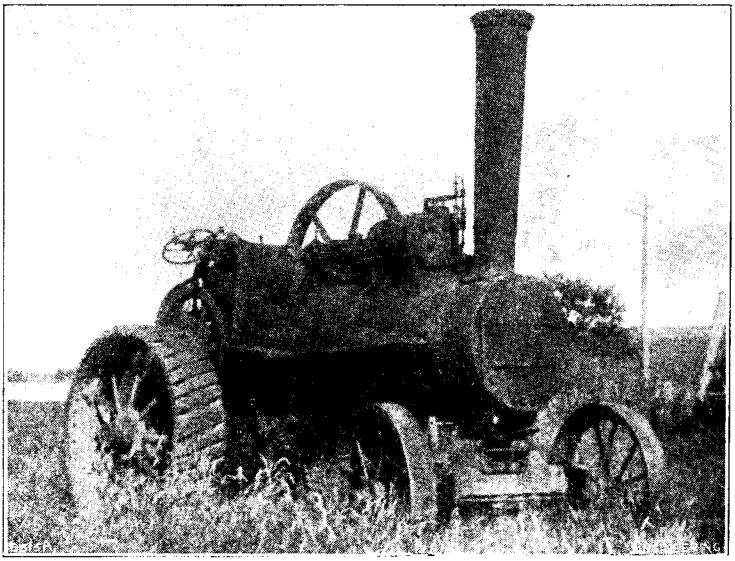
Some country owners and buyers of tractions in the past must have been rather difficult to please, having, like the present-day motorist and motor-cyclist, firmly-rooted ideas as to what constitutes their " ideal " or " dream " machine. In the same way as we find the motoring fraternity changing over engines, gearboxes, frames and adding proprietory and home-made gadgets and fittings off other makes to produce their own ideal in the form of a " Bitza " so do we find some traction engine owners had anticipated the craze, and they too have produced a crop of hybrids. Space is running out so I must ration myself to giving two examples, the first being the roller seen in Fig. 53. Here the front rolls, saddle, chains, axle and chimney came off a Burrell, No. 2161. The remainder of the engine was formerly a McLaren, No. 661. The canopy is from some engine now quite unknown. It is in regular use, sometimes in sight of the Humber.

But the classic example is that shown in Fig. 54 which, in its way, is as unique as Savage's annular compound. Here is the brief specification:

Boiler and rear wheels ..	Fowler.
Cylinder and motion, etc.	McLaren No. 79.
Gears	Savage and Wallis & Steevens.
Gear case	Savage.
Front axle and wheels ..	Fowell.

Many odd fittings, bolts, nuts, etc., off any other scrap engine handy, together with " J. & H. McLaren, Engineers, Leeds, No. 79 " on the brass nameplate on the cylinder, and " Fowell & Sons, St. Ives, Hunts. " cast in relief on the front wheel hubs, caused a headache for the road

Fig. 52. Traction engine by Wm. Weeks & Co., of Maidstone



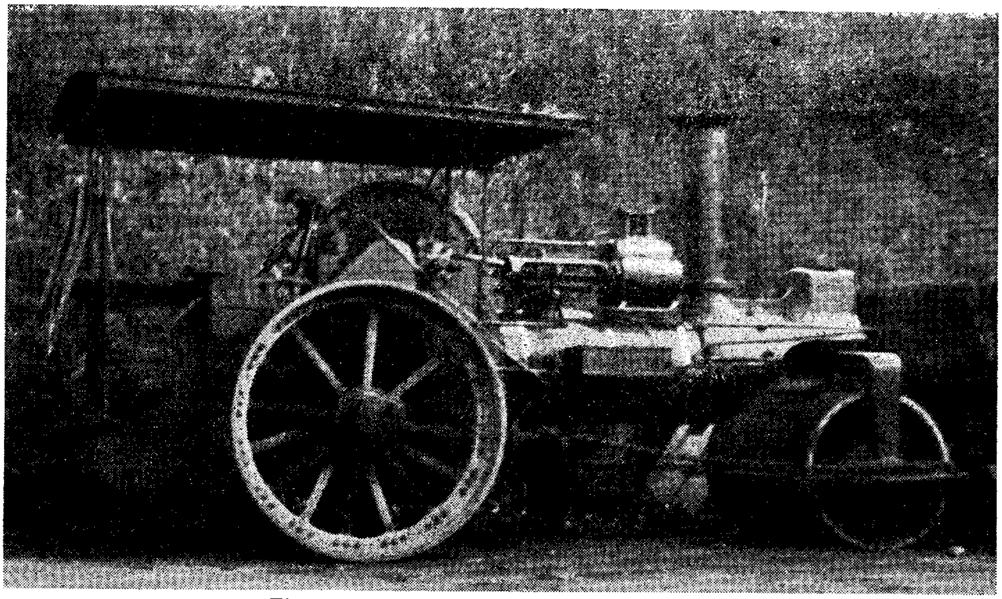


Fig. 53. *A Burrell-McLaren " hybrid " roller*

fund licensors. After much debate internal they decided on the name *Fowler* and as such it ran for many years and worked well as I can testify. Alas, it is now scrapped and gone the hard way of many old engines but the nameplate remains resplendent and polished in my collection to remind me of a clever piece of " adapting " in a Norfolk village.

The late owner confided to me that he found fitting the cylinder-block a " bit of a teaser," as the barrel diameter of the Fowler boiler was a little larger than that of the McLaren, necessitating the removal of a little metal either side of the curved base of the block. It was only a small country shop with no borer handy, so the job was chewed out by hand, using a hammer and cold chisel!

In point of fact, the Mann roller illustrated in Fig. 35 is a simple hybrid, and the enthusiast will no doubt find others.

I am not so sanguine as to imagine the foregoing list is absolutely complete. There may be others, " one-off " jobs that have never been noticed before, and perhaps the details will be forthcoming from those who have had access to them.

In conclusion, I hope the foregoing data and illustrations will be helpful to the model-maker casting around for a subject which is " different," and helpful, too, to the reader who goes out in search of " finds " ; and I wish him the same expectant thrills, adventures and discoveries on his journeys as still befall me when I go out "tractioning" !

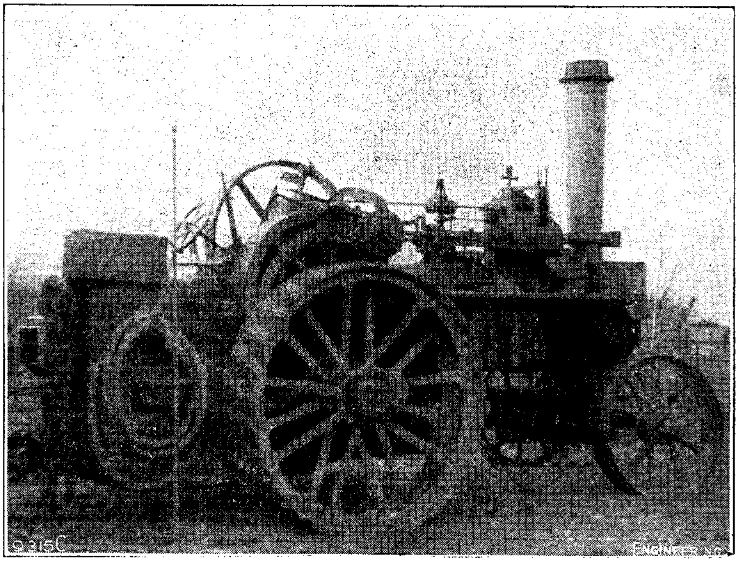


Fig. 54. *A classic example of a traction engine " Bitza "*

DIFFERENT MODELS

THE following notes are intended partly to suggest one or two new ideas for those casting about for something to make, but more to prod the reader into thinking up even more ideas of his own. It has been said that every man has a book in him and if this be true, then surely the model engineer has several fresh ideas in him. This article is intended to make him think of them.

Something that has not been seen for some time is a model safe, complete with some form of combination lock. This could fulfil a useful function for the holding of documents, and be used instead of the tin cash-box which generally seems to end up in the lumber room or under the spare room bed. Or one could be more ambitious and let it into the wall in place of a couple of bricks—the writer has always hankered after the gesture so well known in books: "Lord Dash sauntered over to the painting of Lady Blank, by Gainsborough, and moving it aside, disclosed a small safe let into the wall." (And will some expert describe for us the interesting workings of these combinations? The writer glimpsed one, and it seemed to consist only of four brass discs about 2 in. diameter mounted on a common spindle, each with a small pawl mounted near the periphery, presumably to act as a friction "clutch" operating the next disc; not an impossible job to scale down.)

A very fascinating mechanical device, admittedly not a model, but of interest in the home or office, is the perpetual calendar of Brocot. This deserves study by all who have not come across it for the brilliant simplicity of the idea. With only four wheels it records the day of the week, date, and month, and allows for the correct days to each month including the 29th of February every four years. Once its simple working is understood, the layout of the various components can be adapted to suit the maker's whim, and this in itself affords an entertaining bit of draughtsmanship. Such a calendar could either be mounted to form a date panel in a clock, or be made in the form of a desk calendar actuated by a lever each morning.

Speaking of calendars on tables calls to mind a neat cigarette lighter for table use. It was a model of the commonplace electric fire, of the type that has the heating wire in a zig-zag track nested in a firebrick backing. It stood something over 2 in. high, and trailed a thin flex wire to the back of the desk on which it stood to some low voltage supply. On pressing down the switch at the side it turned itself into a useful lighter.

The portable air compressor so often seen (and heard) on the roads doesn't seem to have been modelled much, probably because although the compressor end will scale down outwardly and work, the diesel engine will not. But there is the stationary type, electrically driven, which is quite capable of looking like the real job and still working. (The compressed air supply could then be used for testing smaller steam models and a multitude of other purposes, but the enthusiast might attempt a model road pick and use it for engraving purposes!)

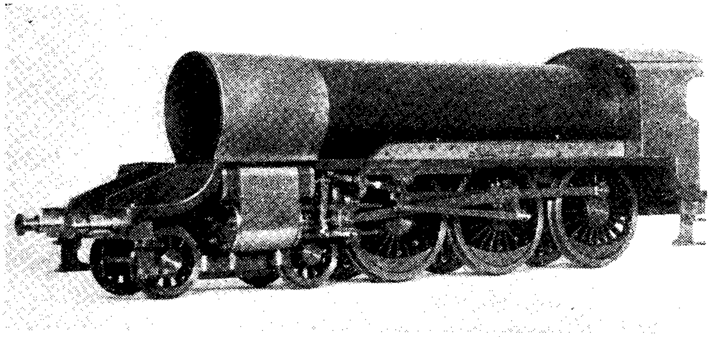
It is odd how some models seem all wrong if out of place. There was a man whose one interest in life was locomotives, and he proposed making, by way of something useful, a coal scuttle in the shape of a scale coal railway wagon, equipped with rubber-tyred wheels ("to roll easily over the carpet for filling") in place of the correct wheels. This we thought was a nauseating idea, but find it difficult to define precisely why it should have so appalled us, particularly when we remember the look of some of the coal scuttles we have seen.

One word of apology should be made to ward off criticism. We knew that none of these ideas were likely to be particularly original before we started, but in proof of it we were rather abashed to come across, just after writing the above, a full description complete with Mr. Gentry's carefully detailed plans of a perpetual calendar in the May 8th, 1930 issue of THE MODEL ENGINEER.—"L.S.S."

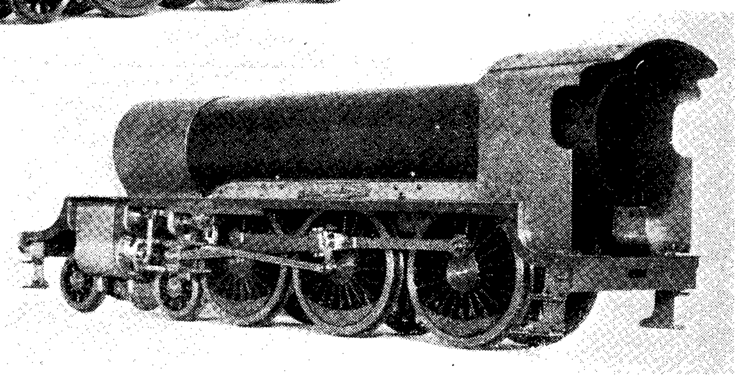
The National Maritime Museum

Some months ago—in our issue for July 7th to be exact—we stated, with reference to the cover picture, that the National Maritime Museum supplied, at a nominal cost, photostats from the drafts of naval vessels which they preserved in their files. This statement was based on previous dealings with the Museum in which we had obtained reduced prints and in some cases 12 in. × 10 in. photographs at about 2s. each. Similar photographs may be obtained of the drafts preserved in the Science Museum, South Kensington. The National Maritime Museum has, however, recently introduced a service which, while being somewhat more expensive, is infinitely more useful to the model maker. The photostats now supplied are full-size reproductions of the drafts and as these are invariably drawn to the scale of ¼ in. to 1 ft., which is the ideal scale for serious models of these ships, the prints are of infinitely greater value to the model maker. The cost of the sheer draft and hull lines is 21s., while the smaller prints of the deck plans cost 7s. 6d. each. These prices are still quite reasonable, especially when one considers the value of the model which it is possible to make from such plans. Photographic negatives of some of the drafts are still kept at the Museum and prints may be obtained at about 2s. each. These are useful to makers of miniature models, especially if the model maker knows how to reduce or increase the print to the desired scale. They are valuable also to the student and research worker who may wish to compare the lines of a series of ships.

A $2\frac{1}{2}$-in. Gauge "King Arthur" Class Loco.



by
H. W. Munday



Views from either end, showing the model almost completed

ONE morning in September, 1930, I journeyed up to London to visit the "Model Engineer" Exhibition. I was travelling on the Southern Railway, and at that time the new "King Arthur" class locomotives were in their heyday, prior to electrification, and I spotted *The Red Knight* with a good load, heading for Brighton; and as we arrived at Victoria, I noticed other engines of the same class.

I was very impressed by their powerful and handsome appearance, and determined to build a model of one of their class as soon as circumstances permitted. I was seventeen at the time, and sixteen years elapsed before I felt able to make a start with any hope of success. That was in May, 1946, when I was demobbed from the Army.

I have previously obtained a very good postcard photograph of No. 767 *Sir Valence*, and I knew the size of the driving wheels; with this as a guide, I prepared drawings to a scale of 17/32 in. to 1 ft. ($2\frac{1}{2}$ in. gauge).

I made wooden patterns for cylinders (piston valve) and horn-blocks, and castings were obtained from these. Wheel castings were stock size from MODEL ENGINEER advertisers. Name-plates were made first—a rather unusual procedure! Each one consists of twelve separate pieces, including letters, cut out with saw and needle-files, and sweated up together over a gas-ring—some job, but worth the trouble!

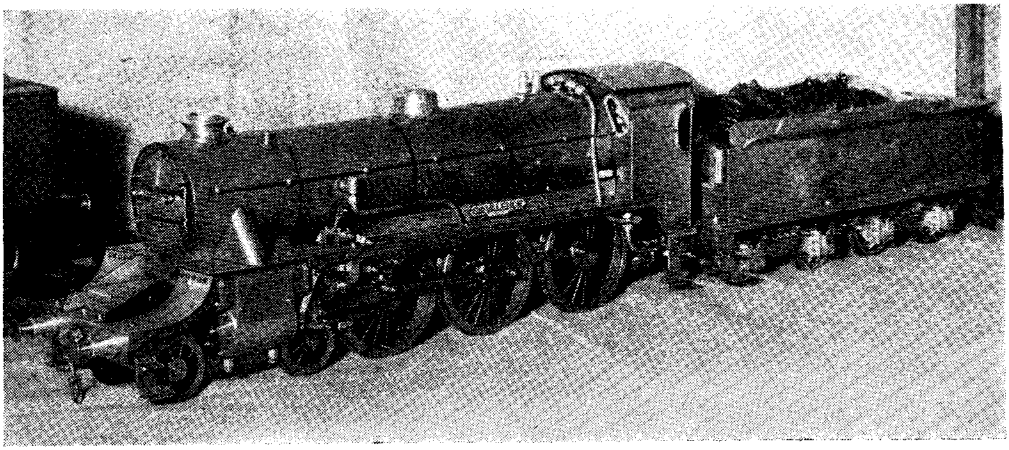
For six months I did all I could without a lathe, and then obtained a "Grayson" $3\frac{1}{2}$-in. screw-cutting lathe from Messrs. Victa Engineering Co. of Maidenhead, which has proved very satisfactory in all respects. I could not obtain a treadle or stand for it, so made one from a Morrison table-shelter, scrap lorry and motorcycle flywheels and the help of the local blacksmith!

This loco and tender has taken 1,200 hours of spare-time, mostly evenings, over a period of $2\frac{1}{2}$ years. I am indebted to your contributor "L.B.S.C." for his very helpful articles which have saved much time when making fittings, etc.

After the first steam trials, I carried out a number of modifications—including a longer water-gauge, new bronze piston-valves, and the fitting of a "Linden" Injector, also resetting valves.

I am pleased to say that the loco will haul me quite easily, and I am now getting used to firing it, which is not too easy in $2\frac{1}{2}$ in. gauge! As there is room for only a few ounces of coal in the firebox, that is understandable.

Working pressure is 80 lb. per sq. in. The double-bogie tender holds $2\frac{1}{2}$ pints of water and approx. $1\frac{1}{2}$ lb. coal.



Mr. H. W. Munday's model, " Sir Valence," on show

PRACTICAL LETTERS

Outboard Engines

DEAR SIR,—With reference to Mr. Smith's letter in your issue for September 22nd.

I had one of these Sachs engines before the war. They were what was called a " side board " motor and were designed for driving canoes.

The capacity of my engine was 98 c.c. and I should imagine the power was nearer 1 h.p. than 1/25.

The mounting was by means of a tube placed transversely across the gunwales to which it was secured by clamps. The engine hung out over the side of the canoe, and could swing on the tube so as to lift the propeller out of the water.

The hollow propeller shaft was about 3 ft. long, and entered the water at about an angle of 30 deg. alongside the boat. Steering was by a rudder on the canoe in the normal position. I found the engine to be far too powerful and heavy for its purpose. My recollection is that it weighed over 30 lb., and this weight hanging over one side made it necessary for the occupant to keep an even keel by leaning to the opposite side.

Full speed on my boat with this engine was about 8 m.p.h., an exhilarating but somewhat unsafe speed for a canoe, as it came out of the water enough to make it extremely unstable.

My engine was well-built and ran well, but as little attempt had been made in the design to save weight it was not really suitable for its intended purposes.

I sold it and bought one of the small American Eltos instead, which was half the weight and drove the canoe at just the same speed.

These Sachs canoe engines were fairly popular on German rivers in the mid-30s, but any that I saw in use were always running well throttled down.

Yours faithfully,

Berkhamsted. JOHN LATTA.

Machining Castings

DEAR SIR,—As you know, this company has a special machining service for locomotive builders and other model makers. We would like to clear up a point which often leads to a client becoming incensed if not dissatisfied. We wish to point out that we are obliged to charge for any work machined (partly or wholly) if the castings prove faulty in course of machining. This, of course, only applies to castings *other than those supplied by this company*.

We have had many defective wheel castings sent to us for machining ; some are full of blow-holes and others will not produce to size owing to serious errors and lack of adequate machining allowance on the pattern. Whilst we endeavour always to give a really first class job, we cannot take any responsibility for castings sent to us for machining in which the aforementioned defects arise.

The remedy is obvious. It is imperative that the intending purchaser shall ask the supplier of castings to guarantee their goods to be able to produce to drawing size by having adequate machining allowances in the *right places*.

All our own locomotive castings are immune from this error. Our wheel castings have produced us some 99.7 per cent. sound wheels in every respect and free from blowholes.

We think that your readers may well ask from their club or other friends interested to find out if the castings they intend to buy are O.K.

We hope this will clear up any misunderstanding amongst readers and absolve us from any liability from any claims when we are contracting to machine castings from other sources.

Yours faithfully,

for QUICKSET TOOLHOLDER CO. LTD.

Birkenhead. H. JONES.